THE Journal

MAY

1951

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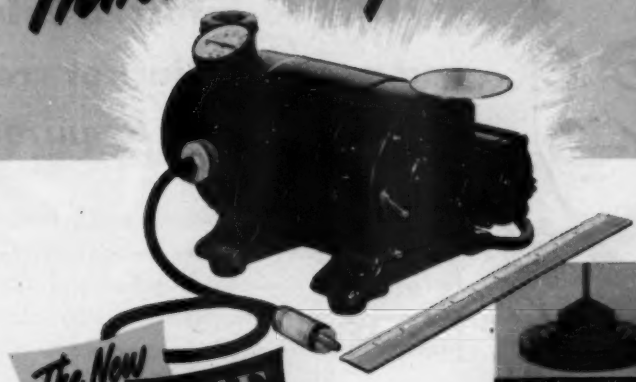

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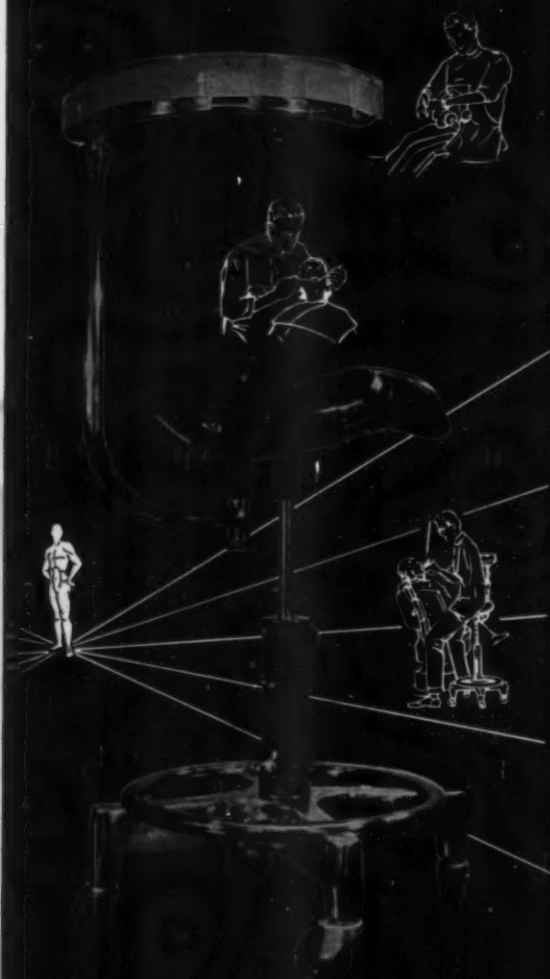

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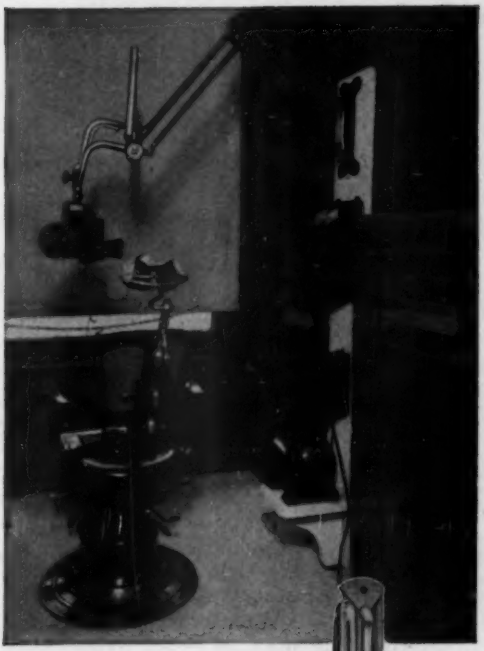

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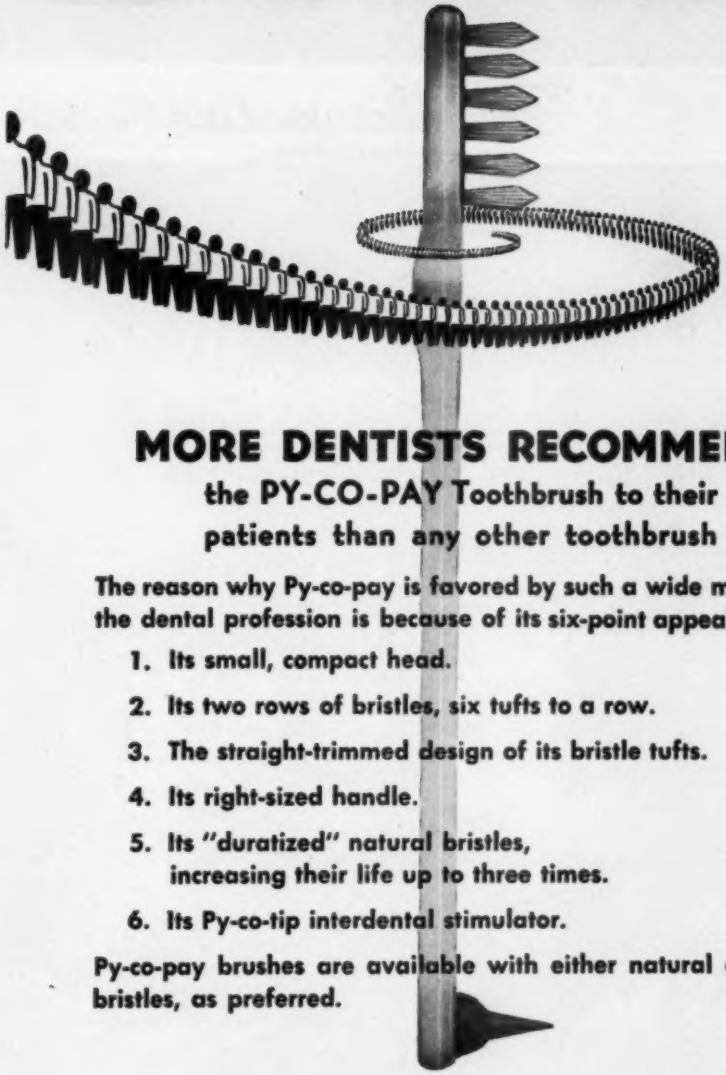

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*Roberts, L. J., Blair, R., Greider, M. *Results of providing a liberally adequate diet to children in an institution.* J. Pediatrics *27*:393:410:418 (Nov.) 1945

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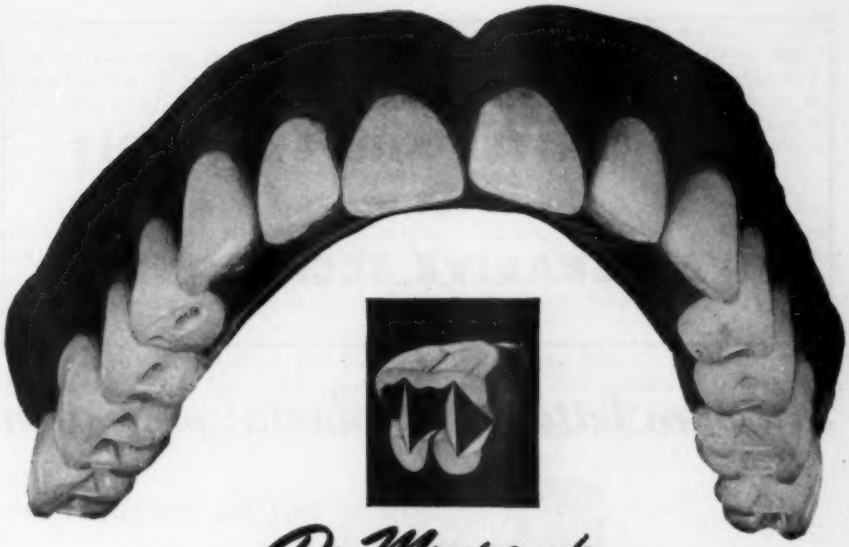

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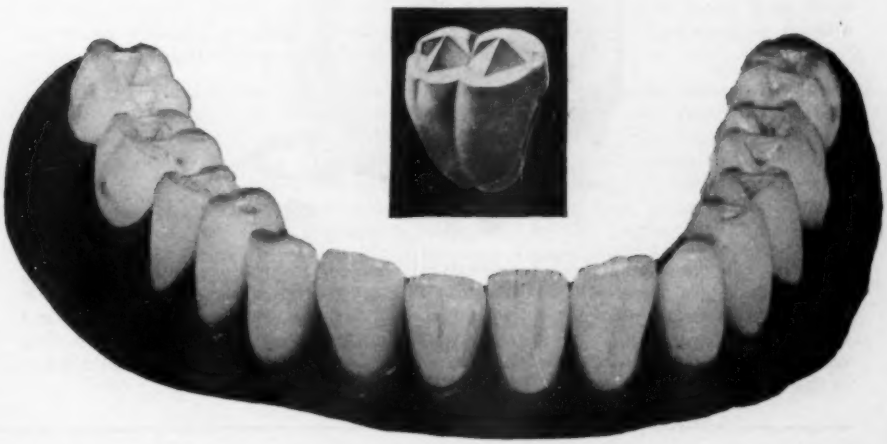

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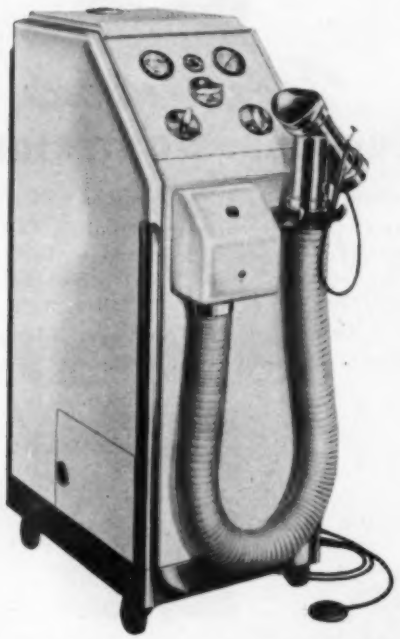

That conventional methods for preparing teeth for restorations and for removing calculus and stain from teeth are disturbing to most patients and responsible for much of the apprehension they associate with dental services has long been recognized, and efforts from one source or another have been almost continuous, during the last sixty years especially, toward improving instruments and technique to promote comfort in the dental chair.

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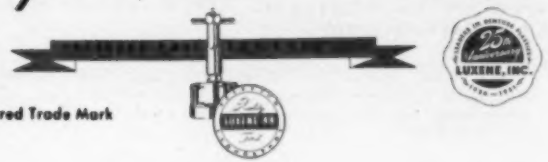

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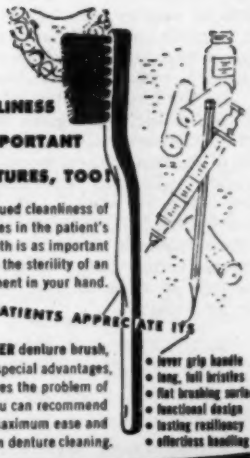

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MAY 1951 VOLUME 42 • NUMBER 5

THE Journal OF THE AMERICAN DENTAL ASSOCIATION

Evaluation of caries-producing potentialities of various foodstuffs

Basil G. Bibby, D.M.D., Ph.D.; Hyman J. V. Goldberg, D.M.D., and Eugene Chen, D.D.S., Rochester, N. Y.

For many years practically all dental investigators have agreed that dental caries is primarily the result of tooth decalcification brought about by acids formed when bacteria act on carbohydrate foodstuffs which are in contact with the tooth surfaces. Recent research findings have done much to abolish any lingering doubts as to the basic correctness of this theory. For instance, attempts to produce dental caries in animals have failed[1] unless fermentable carbohydrates are present in the diet and allowed to come in contact with the teeth. However, if such a diet is fed[2] by means of stomach tubes, caries does not occur. Furthermore, carbohydrates do not produce dental decay in the mouths of bacteria-free animals.[3] In addition, dental caries is inhibited by the antibacterial action of penicillin[4] or by agents such as fluorine or iodoacetic acid[5] which prevent the bacteria from forming acid.

Agreement on causation of a disease does not necessarily mean that practical methods for its prevention are at hand. Instead, it only points toward areas in which further investigation is most likely to produce practical results. That is the situation in respect to research on the pre-

Prize winning essay read before the Midwinter Meeting of the Chicago Dental Society, February 7, 1951.

This study was supported by a grant from the National Institute of Dental Research.

From Eastman Dental Dispensary, Rochester, N. Y.

1. Zepplin, Marie, and others. Dental caries in the cotton rat. XI. The effect of feeding a natural diet comparable to a human diet. J. Nutrition 40:203 (Feb. 10) 1950.

2. Kite, O. W.; Shaw, J. H., and Sognnaes, R. F. An influence on dental caries incidence produced in rats by tube-feeding. (Abst.) J. D. Res. 29:668 (Oct.) 1950.

3. Orland, F. J. An evaluation of bacteria and antibiotics in the dental caries process. Mil. Surgeon 106:345 (May) 1950.

4. Zander, H. A. Effect of a penicillin dentifrice on caries incidence in school children. J.A.D.A. 40:569 (May) 1950.

5. Miller, B. F. Inhibition of experimental dental caries in the rat by fluoride and iodoacetic acid. Proc. Soc. Exp. Biol. Med. 39:389 (Nov.) 1938.

vention of dental decay. It is reasonably certain that the principal variables which determine the activity of dental decay are the nature of the carbohydrates eaten, and the amount of contact they have with the teeth surfaces and their bacterial environment. As yet, however, this knowledge cannot be applied to the prevention of dental decay in a universal or practical way. Obviously, the closest examination of the possibilities in this area is indicated.

Theoretically, the elimination of sugar and other fermentable carbohydrates from the diet will prevent dental decay. It also has been demonstrated[6, 7] that the progress of dental decay can be retarded in actively interested and well controlled patients whose carbohydrate intake can be restricted sufficiently. However, in the face of a natural appetite, advertising promoting consumption and, in some groups, a definite dependence on refined carbohydrates as a source of dietary calories, such a procedure is limited in its application. This is particularly applicable in controlling dental decay in large groups of children.

The practicability of reducing the intake of sugary foods by children unless substitutes are offered for the withdrawn confections is doubtful. However, a useful step would be taken if carbohydrate foodstuffs were listed according to their relative caries-producing activity. Then it would be possible to recommend to patients the withdrawal of the more destructive foods from their diets and the substitution of less destructive ones. Such dietary advice would more likely be followed by both children and their parents. Thereby, further progress could be made toward providing a practical method for controlling dental decay.

The idea of evaluating the caries-producing activity of various foods is not new. As one of the steps in the formulation of his chemicoparasitic theory on dental caries, Miller[8] placed teeth in mixtures of bread and so forth, and observed the relative amount of decalcification produced. Walkhoff[9] carried out similar studies. Because both investigators used long incubation periods, which have no relation to the periods of acid formation or carbohydrate retention in the mouth, their conclusions have little application to the problem of caries prevention. Wallace[10] has stressed the importance of the physical composition of foods in the prevention of dental decay but has never offered any specific evidence to support his claims. Pickerill[11] also rated foodstuffs in respect to their effect on caries causation but made his rating on the basis of the effects of food on salivary secretion rather than on their retention or acid formation in the mouth.

In order to justify selective recommendations of foodstuffs for caries prevention, it is necessary that a reliable measurement or index of caries-producing potentialities be worked out for the principal carbohydrate-containing foodstuffs. It is not enough to know about the clearance and acid production of pure carbohydrates in the mouth inasmuch as few carbohydrates are consumed in a pure state. Instead, they are eaten in various appetizing mixtures and it is essential to know the caries-producing potentialities of these foodstuffs in the actual form in which they are consumed before any findings have practical value.

If caries is the result of acid formation from food on the tooth surfaces, then it seems that measurement of the amount of acid formed from a unit amount of foodstuff by oral bacteria when multiplied by the number of units of that food-

6. Jay, P. The role of sugar in the etiology of dental caries. J.A.D.A. 27:393 (March) 1940.

7. Becks, H.; Jensen, A. L., and Millarr, C. B. Rampant dental caries: prevention and prognosis. J.A.D.A. 31:1189 (Sept.) 1944.

8. Miller, W. D. The micro-organisms of the human mouth. Philadelphia, S. S. White Mfg. Co., 1890.

9. Walkhoff, Otto. Unser Brot als wichtigste Ursache der Zahnkaries. Muenchner med. Wochschrft. 64:1007, 1917.

10. Wallace, J. S. The newer knowledge of hygiene in diet. J.A.D.A. 18:1322 (July) 1931.

11. Pickerill, H. P. The prevention of dental caries and oral sepsis, ed. 3. New York, Paul Hoeber, 1923.

stuff adhering to the teeth after eating it, would indicate the potentiality of that food to produce tooth decalcification: that is, units of acid formed from food by oral bacteria times units of food adhering to the tooth after eating equals the decalcification potential of food.

This paper records the development of a practical method for determination of the decalcification potentials of foods; tabulations comparing the decalcification potentials of different foodstuffs; a test of the relationship between decalcification potentials of foods and the production of dental caries in the Syrian hamsters (*Cricetus auratus*), and some investigations into the factors which determine the decalcification potentials of foodstuffs.

DETERMINATION OF DECALCIFICATION POTENTIALS OF FOODS

In order to calculate the decalcification potentials of foods, it is necessary to have reliable measurements of: (1) the amount of acid formed from a foodstuff by the action of oral bacteria and (2) the amount of that foodstuff adhering to the teeth. The methods developed will be discussed.

Determination of Acid Production • The procedure used for determining acid production was to ferment food suspensions in saliva.

Three grams of the test foodstuff were thoroughly mixed with 100 cc. of distilled water in a Waring blender. Aliquots of 5 cc. of this food mixture were pipeted into the test tubes containing 5 cc. of paraffin stimulated saliva. These tubes were then incubated at 37.5°C. A preliminary titration of 1 aliquot was made with 0.1 normal sodium hydroxide. Other aliquots were titrated for acid at 4 and 24 hours. Although reasonable question can be raised as to whether the food mixtures used in these tests were sufficiently concentrated, it is felt that the relatively dilute food mixtures used would represent more accurately than would concentrated mixtures the conditions obtaining on the tooth surface during the period of salivary stimulation which follows eating. After preliminary duplicate tests demonstrated the reliability of the method, only single tests were run in most instances. In another section of this report consideration is given to differences in the acid-producing capacity of salivas from different individuals.

Measurement of Retained Food • Few attempts seem to have been made to measure actual food retention on the teeth. Teuscher and Fosdick[12] have studied the persistence of reducing sugars in the mouth after eating candies and sugary desserts. Volker and Pinkerton[13] have also measured glucose clearance after eating various sugar-containing confections. However, their methods are not suitable for our problem because they measured only glucose and because they were concerned with food retention in the mouth as a whole instead of on the teeth. The possibility of using indicator substances such as dyes, chemicals, or radioactive isotopes was abandoned largely because of the difficulties of incorporating such substances into the foods without destroying either their palatability or normal consistency. Recovery of foods from the mouth for drying and weighing seemed to be too inaccurate because the quantities of food which would be recovered would be so small that additions of epithelial or other debris from the mouth would make reliable measurements unlikely.

The method employed was to use the total carbohydrate content of the food as

12. Teuscher, G. W., and Fosdick, L. S. Retention of reducing sugars in saliva after mastication of carbohydrates. (Abst.) J. D. Res. 16:354 (Aug.) 1937.

13. Volker, J. F., and Pinkerton, D. M. Factors influencing oral glucose clearance. J. D. Res. 26:225 (June) 1947.

Table 1 • Tests of carbohydrate method

Food analyzed	Percentage carbohydrate content				
	Our analyses		Published data		
	1	2	*	†	‡
White bread	51.6	50.8	52.2	52.2	52.3
Raw carrot	8.0	8.4	8.2	8.2	9.3
Noodles	71.3	72.1	—	75.6	70.6
Graham crackers	71.6	70.9	—	72.3	74.3

*Nutritional charts. Pittsburgh, Heinz Co., 1942.

†Handbook of chemistry and physics, ed. 30. Cleveland, Chemical Rubber Pub. Co., 1947.

‡Hawk, P. B., and others. Practical physiological chemistry, ed. 12. Philadelphia, The Blakiston Co., 1947.

an indicator of the total food retention. If the total percentage of carbohydrate in a food was known, the carbohydrate recovered in food remnants collected from about the teeth would provide a base for calculating the total food retained on the teeth. According to our thesis the total food retained on teeth equals carboyhydrate recovered from teeth times 100 divided by the per cent of carbohydrate in the foodstuff.

After experimenting with some other methods, it was found that the Somogyi-Shaffer-Hartmann method for quantitative determination of carbohydrate[14] could be applied most satisfactorily to the small quantities of food which were likely to be retained about the teeth. Provided these analyses were made after the carbohydrates of the foodstuff had been hydrolyzed in acid, a figure representing the total measurable carbohydrates could be obtained. It was realized that the hydrolysis and carbohydrate analysis might not account for all of the sucrose in the foods tested. However, in view of the fact that the carbohydrate figures were designed only for use as indicators of the amounts of total foodstuffs, a consistent deviation from absolute values had no practical importance.

As a preliminary test of the applicability of the method to our problem and as a test of the accuracy of our methods, repeated carbohydrate determinations were made on some common foodstuffs. Satisfactory duplication of results was obtained. A comparison of the figures obtained in these determinations with those of published data on the carbohydrate content of foods offered further evidence on the reliability of the method and technics employed in this study. Typical findings are given in Table 1.

The figures obtained in our laboratory compared closely with those obtained elsewhere and indicated that the method was accurate enough to justify applying it to the measurement of carbohydrate retention about the teeth.

An outline of the analytical method employed in this study which includes the Somogyi-Shaffer-Hartmann procedure follows:

1. A homogeneous sample of food weighing between 1 and 2 Gm. was taken and accurately weighed.
2. It was mixed with 200 cc. of distilled water and 20 cc. of hydrochloric acid was added (specific gravity 1.125).
3. The mixture was placed in an autoclave of 121°C. for one hour to hydrolyze the carbohydrates to simple sugars.
4. The mixture was neutralized with sodium hydroxide and brought up to 250 cc.
5. Five ml. of sugar solution (if 5 ml. contains more than 2.5 mg. of sugar, the mixture must be diluted) was accurately measured into a test tube and 5 ml. of copper reagent (25 Gm. sodium carbonate, 25 Gm. Rochelle salt, 75 ml. 10 per cent copper sulfate solution, 20 Gm. sodium bicarbonate, 5 Gm. potassium iodide plus distilled water to make one liter) was added. A blank containing 5 ml. of distilled water and 5 ml. of copper reagent was also prepared and both were heated at 100°C. for 15 minutes and immediately cooled.

14. Shaffer, P. A., and Somogyi, M. Copper-iodometric reagents for sugar determination. J. Biol. Chem. 100:695 (May) 1933.

6. Five ml. of 1.0 normal sulfuric acid was added to each tube and the tubes were allowed to stand for five minutes to dissolve the cuprous oxide or iodide which may have precipitated.

7. The excess iodine was titrated with 0.005 normal sodium thiosulfate using 1 per cent starch solution as an indicator.

8. The titration value for the sugar solution was deducted from the blank titration. The difference is equivalent to the quantity of cuprous oxide formed by the reducing action of the sugar. Thus it is possible to determine the amount of sugar present.

The carbohydrate method was also applied to filtrates of emulsions of the test foods to give a rough estimate of the amount of readily soluble carbohydrates in the foods which it was thought might be related to the acid producing capacity of the food. Figures obtained by such analyses are included in the tables.

If reliable measurements of the retention of different types of food were to be made, it was necessary not only to have a method of the sort described which was suitable for measuring such quantities of food as can be recovered from the teeth, but it was equally important to have a reliable procedure for collecting retained foodstuffs from about the teeth. To give useful results such a collection procedure should be able to recover all foodstuffs from the teeth, or at least a constant percentage of the retained foodstuffs after eating.

There seemed to be two possible ways of achieving this end, both of which would mean that the experimental subject necessarily would have to follow a fixed procedure of food chewing. One was for the subject who had eaten the foodstuff to follow a rigid routine of toothbrushing in his own mouth. The other was to have the experimenter use an atomizing or similar procedure for cleaning the teeth of the subject. For the purpose of testing the relative efficiency of the two procedures a comparison of food recoveries was made in an experienced subject following the eating of several foods. Table 2 records the amounts of foodstuffs recovered using the toothbrush and the atomizer.

Table 2 • Comparison of food recovery using toothbrush and atomizer

Test food	Mg. food recovered from teeth	
	Toothbrush	Atomizer
White bread	112	114
Cream of Wheat and milk	130	136
Shredded Wheat and milk	181	184
Laboratory cake VII	103	105
Laboratory cake IX	120	123
Laboratory cake X	81	84
Fruit cake	73	75

It can be seen that there is a similarity in the result but that the use of the atomizer seems to be slightly more efficient than the use of the toothbrush. It may be concluded that either technic was acceptable. In this study toothbrushing could be used advantageously by the experimenter on himself but the atomizing procedure was more adaptable when tests were being made on different individuals. With few exceptions that was the basis for selecting the technics used in collecting the results herewith presented.

Among the variables which have to be considered in attempting to make a quantitative food recovery are the questions of whether a fixed quantity of foodstuff should be taken into the mouth, whether it should be eaten in the normal way and then swallowed, whether any standard chewing time or number of masticatory strokes should be required, and perhaps most important of all, the question of determining when mastication was complete and when the retained food should be collected. Preliminary tests were carried out in relation to all of these points and a fixed procedure developed on the basis of the reproducibility of

Table 3 • Accuracy of measurement of food retention

Food tested	$C(H_2O)$* intake mg.	$C(H_2O)$ expectorated mg.	$C(H_2O)$ recovered from teeth mg.
Social tea biscuit	1,827	1,766	51
Raisin fruit biscuit	2,004	1,829	172
Trio cooky	1,929	1,880	46
Fig bar	1,743	1,564	165
Oreo Cream Sandwich	1,458	1,377	77
White bread	1,557	1,502	51
Laboratory cake I	1,890	1,814	73

*The symbol $C(H_2O)$ is used throughout these tables to indicate carbohydrate.

food collection figures in repeated tests on different subjects. The decision as to the final procedure to be followed was made on the basis of the reproducibility of the results and the absence of any artificial conditions which would make the findings different from those which could be expected when foods were eaten naturally. The procedure settled upon was as follows:

The test subject chewed several mouthfuls of the test substance until such time as the subject was ready to swallow. After the last swallow and after the subject had followed the act of deglutition by cleansing his mouth and teeth with his tongue and completing any habitual tooth sucking or other terminal swallowing acts, the mouth was washed and the teeth immediately cleaned with either the toothbrush or atomizer. All washings were collected in a beaker and made up to constant volume.

As a means of testing whether the procedure used for collecting the food gave a reliable measurement of the amount retained about the teeth, a series of tests were run in which the patients chewed their food in the normal way, but instead of swallowing it, expectorated the bolus into a container and did the same with the terminal mouth cleanings obtained by sucking or tongue action. Thereafter, the teeth were carefully brushed and all the washings were collected in another container. Determinations of the amount of carbohydrate and thereby the amount of food represented in each fraction were made separately and the result compared with the known quantity of food taken into the mouth for chewing. The results of this test are presented in Table 3.

Since the total amount of food recovered from expectoration and toothbrushing matches closely the total quantity taken into the mouth, it can be assumed that the brushing technic used gave a reliable indication of the amount of food retained on the teeth. Actually, the recovery figures which showed losses of between 2.5 per cent and 8 per cent of the carbohydrate retained on the teeth are surprisingly accurate and seem to give good support for the reliability of the procedure adopted.

DECALCIFICATION POTENTIALS OF DIFFERENT FOODSTUFFS

Following the establishment of a satisfactory method for determining decalcification potentials, the procedure was applied to a variety of foodstuffs. Since the purpose of the study was primarily to determine the caries-producing potentials of common foods in the form in which they are actually eaten, commercially distributed products comprised a large portion of the foodstuffs tested. They can be grouped conveniently into the following loose classes: (1) breads and bread products, (2) cereal products, (3) crackers, (4) cookies, (5) desserts, (6) candies and soda, (7) fruits, (8) vegetables. The re-

sults of the determination on each of these groups of foods will be presented in the order given above.

Breads and Bread Products • The findings are recorded in Table 4. It is apparent that the decalcification potentials vary widely. The highest figure is 541 for bread and peanut butter, the lowest, 18 for egg noodles. Ordinary white bread gives a reading of 164, higher than either whole wheat bread or rye bread. The addition of margarine to the bread decreases the decalcification potential as a result of a reduced food retention, while the addition of jam has a reverse effect. In this group of foodstuffs the amount of food retained on the teeth seems to be the significant factor in determining the decalcification potentials since it shows much wider variations from food to food than does the acid production. The effect of the addition of margarine to bread is of particular interest and suggests that the fat content of foods may have a considerable bearing on their decalcification potentials.

Cereal Products • The decalcification potentials and related information on the group of cereal products are listed in Table 5. It is noticeable that the corn products have low decalcification potentials which are directly related to low retention figures. However, cheese popcorn gives a higher potential than popcorn because of the high acid production from the former. The lower retention figure given by fried rice when compared with boiled rice strengthens the idea that fats tend to reduce food retention. It is interesting to note that the decalcification potentials in general are in the same range as those of the bread group.

Crackers • The values given by the crackers tested (Table 6) are as a whole lower than those for the bread and cereal groups. This is in keeping with subjective experience for the low items but somewhat unexpected for some of the others. The oil-sprayed cheese crackers proved to be a food which, because of a relatively high acid production, gives a higher decalcification potential than a comparable food (oil-sprayed crackers) which has a higher retention figure. The higher retention figure given by unsalted as compared with salted crackers suggests that the saltiness of a food may tend to reduce its retention on the teeth.

Cookies • None of the cooky figures (Table 7) are as low as those given in

Table 4 • Bread and bread products

Food	Total $C(H_2O)$ %	Soluble $C(H_2O)$ %	Food retained mg.	Acid formed ml. of 0.1 N. 4 hr.	Acid formed ml. of 0.1 N. 24 hr.	Decalcification potential
Egg noodle	71.3	9.0	16	1.1	2.0	18
Zwieback	71.3	23.4	29	1.2	2.8	35
Swedish bread	70.2	19.1	41	1.6	2.3	66
Bread and margarine	43.9	12.8	35	2.0	2.3	70
Whole wheat bread	47.3	6.5	76	1.5	2.2	114
Rye bread	50.6	13.7	67	1.9	3.0	127
Toast and margarine	55.0	6.0	73	1.8	3.1	131
Cinnamon melba toast	45.0	16.6	94	1.5	1.6	141
White bread	51.6	13.0	91	1.8	1.9	164
Potato bread	52.5	23.6	120	1.5	1.7	180
Bread, margarine and jam	56.3	11.4	99	2.1	2.8	208
Doughnut	61.9	25.7	184	1.7	3.1	313
Danish pastry	53.8	40.0	181	1.9	2.7	434
Bread and peanut butter	26.2	7.1	338	1.6	2.3	541

Table 5 • Cereal products

Food	Total $C(H_2O)$ %	Soluble $C(H_2O)$ %	Food retained mg.	Acid formed ml. of 0.1 N. 4 hr.	24 hr.	Decalcification potential
Corn flakes	84.6	14.6	21	0.7	2.4	15
Popcorn	74.1	12.9	32	1.5	2.9	48
Corn chips	54.5	13.7	41	1.2	2.4	49
Rice flakes	83.0	14.8	60	0.9	2.4	54
Cheese popcorn	62.2	10.5	26	2.1	2.6	55
Puffed Rice	83.3	13.9	63	1.1	2.6	69
Fried rice	25.1	2.8	65	1.6	1.8	104
Boiled rice	23.9	4.1	81	1.7	2.3	138
Wheat flakes	74.7	17.5	77	2.0	2.3	154
Cream of Wheat and milk	19.3	4.2	130	1.5	1.6	195
Shredded Wheat and milk	25.4	7.2	181	1.3	2.4	235
Bran cereal and milk	25.3	10.3	160	1.6	1.4	256

the previous groups, and, as could have been anticipated if the theory of this work is sound, most of the cookies have relatively high decalcification potentials. However, it was unexpected to find that these higher potentials were more directly related to higher food retention than they were to greater acid production. Actually, the average four hour acid production figure for the cookies was 1.5 while that of the breads, cereals, and crackers were 1.6, 1.4 and 1.6 respectively. It would seem that the factor contributing to higher food retention in the cookies should be investigated to determine whether it is influenced by the content of sugar or other ingredients, or whether it is the result of the manufacturing processes bringing about changes in the constituents such as gelatinization of starches which would influence their physical consistency and retentivity in the mouth. There is a possibility that in addition to the ingredients used, the mixing and cooking procedures may modify the caries-producing potentialities of foodstuffs. The low figure given by a sandwich cooky is of interest. Here a high soluble carbohydrate figure is associated with a low retention and an average acid production figure. In this there is the suggestion that from the point of caries prevention the segregation of the sugar into separate layers, as in the sandwich type cooky, may have advantages over incorporation of the sugar throughout the whole cooky mass. The ex-

Table 6 • Crackers

Food	Total $C(H_2O)$ %	Soluble $C(H_2O)$ %	Food retained mg.	Acid formed ml. of 0.1 N. 4 hr.	24 hr.	Decalcification potential
Oil-sprayed cracker	72.1	12.1	44	0.6	3.0	26
Oil-sprayed cheese cracker I	66.5	6.7	40	0.9	3.2	36
Oil-sprayed Shredded Whole Wheat Wafers	72.5	6.1	72	1.3	1.9	94
Finger-shaped soda cracker	69.0	12.0	100	1.0	1.2	100
Large soda cracker	73.0	14.0	60	1.7	2.7	102
Oil-sprayed cheese cracker II	65.5	14.9	54	2.1	3.2	113
Soda cracker (salted)	72.8	11.1	73	1.6	3.2	117
Pretzel stick	73.9	14.8	40	3.1	2.9	124
Soda cracker (unsalted)	72.0	12.9	96	1.5	2.4	144
Oyster cracker	68.4	13.3	102	1.7	2.6	173

Table 7 • Cookies

Food	Total $C(H_2O)$ %	Soluble $C(H_2O)$ %	Food retained mg.	Acid formed ml. of 0.1 N. 4 hr.	24 hr.	Decalcification potential
Animal cracker	71.8	14.0	65	1.0	2.6	65
Arrow root biscuit	71.2	11.2	45	1.6	3.6	72
Sweet tea biscuit	70.9	16.8	83	1.3	2.9	108
Assorted filled sandwich cooky	64.1	26.5	72	1.5	2.4	108
Butter-flavored cooky	70.0	23.6	127	1.5	2.2	191
Macaroon	65.1	18.7	48	2.4	3.0	115
Ginger snap	71.1	22.5	158	0.8	3.2	126
Filled chocolate sandwich cooky	68.6	16.0	159	0.9	2.3	143
Orange macaroon	63.0	26.0	94	1.8	2.5	169
Coconut Jumble	70.2	18.9	119	1.7	2.4	202
Toll House	65.0	14.2	140	1.5	2.7	210
Black walnut	53.0	19.1	137	1.6	2.8	219
Graham cracker	71.6	21.6	226	1.0	2.6	226
Sugar	74.6	17.0	154	1.5	2.6	231
Milk cracker	76.6	16.0	139	1.8	2.5	250
Fudge	59.4	10.1	130	2.0	2.1	260
Shortbread	61.8	24.8	244	1.4	2.8	342
Fig bar	71.2	27.6	266	1.9	3.3	505

tremely high figure given by fig bars, on the other hand, indicates that it is necessary that neither the sweet layer nor the body of the cooky should have an unusually adhesive character.

Desserts • The group of desserts (Table 8) which includes cakes gives values very comparable to those of the cookies. The low retention figures given by most of the cakes is interesting. For one of these (fruit cake) an outstandingly high acid-production figure was found. This had the effect of raising the decalcification potential to a relatively high level. The high retention figures given by desserts of creamy texture (chocolate pudding and ice cream) is sufficiently out of line

Table 8 • Desserts

Food	Total $C(H_2O)$ %	Soluble $C(H_2O)$ %	Food retained mg.	Acid formed ml. of 0.1 N. 4 hr.	24 hr.	Decalcification potential
Golden loaf cake	64.3	29.5	55	1.2	2.9	66
Blue Ribbon Cake	51.2	21.4	72	1.5	2.2	108
Short bread cake	51.8	9.4	112	1.4	1.7	157
Egg custard	25.6	11.5	139	1.2	1.4	167
Devil's food cake	66.5	18.3	139	1.3	2.8	181
Apple sauce loaf cake	56.2	25.6	103	1.8	1.8	185
Fruit cake	64.0	25.6	74	2.5	2.9	185
Butterscotch pudding	28.9	17.0	153	1.3	1.7	198
Lemon pie	38.2	15.4	114	1.8	3.0	205
Angel food cake	66.6	25.8	125	1.8	3.1	225
Apple pie	41.5	17.8	154	1.8	1.8	227
Rice pudding	32.0	14.1	146	1.6	2.2	234
Cherry pie	42.0	17.1	130	1.8	2.4	234
Ice cream	20.7	20.0	196	1.3	2.4	255
Plum pudding	39.0	23.0	144	1.8	2.7	259
Apple turnover	40.5	17.9	147	1.8	1.8	265
Chocolate pudding	34.4	18.5	197	1.6	2.0	315

Table 9 • Candies and sodas

Food	Total $C(H_2O)$ %	Soluble $C(H_2O)$ %	Food retained mg.	Acid formed ml. of 0.1 N. 4 hr.	Acid formed ml. of 0.1 N. 24 hr.	Decalcification potential
Grape soda	9.4	9.4	22	1.2	1.7	26
Orange soda	9.5	9.5	22	1.9	2.9	42
Mound (coconut)	49.0	33.4	36	1.3	1.8	112
Bonbon (honey coconut)	55.5	26.0	98	1.5	1.8	147
Nugget (chocolate)	78.4	15.0	87	1.7	2.6	148
Orange sucker	63.5	63.5	96	1.6	2.1	154
Peppermint gumdrop	76.5	57.2	141	1.4	2.1	197
Chocolate (nonpariel)	44.7	37.1	154	1.6	2.4	246
Chocolate (almond milk)	50.1	38.0	190	1.6	2.5	304
Chocolate (milk)	50.0	39.0	197	1.6	2.7	315
Milky Way	68.5	51.1	394	0.8	2.5	315
Toffee (almond butter)	50.5	26.5	216	1.7	2.0	367
Caramel	56.8	43.0	219	1.8	2.1	394

with expectations to suggest the need of a more critical examination of these findings.

Candies • Because candies differ more in flavor than in other basic characters the group studied (Table 9) is limited in size. However, the group contains representatives of the commonest types of candies. As would be expected the figures are in the high range, although Mounds, which contain an oily cream filling, mixed with nonadhesive particulate material gave a surprisingly low decalcification potential (112). The figures for hard candies do not adequately represent their potential destructiveness to the teeth because the decalcification figure records only the conditions which were obtained after completion of eating and not those which operated during a lengthy eating or sucking period. Although it is realized that the measurement of decalcification potentials is not well suited for beverages, determinations were made on two common soda drinks. As was predictable from Volker's[13] study which showed that sugar solutions are rapidly eliminated from the mouth, low retention figures and consequent low decalcification potentials were obtained.

Fruits • The decalcification potentials for this group (Table 10) include almost the lowest (apple, 4) and the highest (dried fig, 665) figures which were found. The

Table 10 • Fruits

Food	Total $C(H_2O)$ %	Soluble $C(H_2O)$ %	Food retained mg.	Acid formed ml. of 0.1 N. 4 hr.	Acid formed ml. of 0.1 N. 24 hr.	Decalcification potential
Apple	13.2	11.0	3	1.4	2.5	4
Pineapple (canned)	37.3	30.9	31	0.7	2.2	22
Peach (canned)	12.3	11.6	30	1.6	3.3	48
Pear	11.0	8.9	65	2.0	2.3	130
Grape	19.6	15.0	85	1.7	1.6	145
Plum	20.5	12.4	93	1.8	1.9	167
Banana	20.2	13.4	100	1.8	2.6	180
Dry prune	70.0	28.0	265	1.9	2.6	504
Date	77.5	33.8	297	1.7	3.5	505
Fig	73.0	31.2	350	1.9	3.7	665

variations in the retention figures are far greater than those for acid production. The high figure for dried fruits is noteworthy because it raises serious doubt as to the soundness of some of the dental educational material which recommends such fruits for use in supposedly caries-reducing diets. The finding with figs has historic interest because Aristotle, in what is believed to be the first written suggestion on the causation of dental caries, attributes caries to sweet figs sticking to the teeth.

Vegetables • A wide range of results was given by the tests on vegetables (Table 11). Extremely low decalcification potentials were found for cooked or raw carrots, but values as high as those given by some desserts and cookies were found for some of the starchy or sweet vegetables such as potatoes, squash and parsnips. That the consistency or texture of the food, its processing or fat content influences the retention figures is demonstrated by a comparison of potato chips (61), mashed potato (74), and boiled potato (120). There are also interesting differences in acid production which may be related to some of the same factors. For instance, the four hour acid-production figure for potato chips, mashed potato, and boiled potato were 1.9, 3.3 and 2.4, respectively.

Comment • In discussing the results which have just been presented (Tables 4 to 11) a number of suggestions have been made as to factors which might influence the magnitude of the decalcification potentials recorded in this study. From the number of suggestions made it must be concluded that the influences determining the decalcification potentials are extremely complex and that it would be an error to oversimplify them in any way. Obviously, since the relationship between the decalcification potential of foods and dental caries is still a hypothetical one, it would be an even greater error to draw any final conclusions as to the effects of any of these food factors on clinical caries. Before this can be done it is necessary, first, that the influences indicated be related more definitely to the decalcification potentials which they might modify, and second, that the relationship between the decalcification potential of foods and their capacity to produce dental decay be more definitely established. Attention is given to these problems in this paper.

DECALCIFICATION POTENTIALS AND CARIES PRODUCTION

The only certain way of determining whether the decalcification potentials of food are directly proportional to their

Table 11 • Vegetables

Food	Total $C(H_2O)$ %	Soluble $C(H_2O)$ %	Food retained mg.	Acid formed ml. of 0.1 N. 4 hr.	Acid formed ml. of 0.1 N. 24 hr.	Decalcification potential
Carrot (cooked)	8.3	6.8	2	1.0	1.5	2
Carrot	8.0	5.4	3	1.4	1.2	4
Lettuce	2.1	1.8	13	1.2	1.1	16
Cucumber	2.3	1.9	23	1.1	1.0	25
Cabbage	4.3	2.8	33	1.3	1.2	43
Potato (chip)	48.2	12.7	61	1.9	2.9	116
Potato (mashed)	22.4	3.6	74	3.3	3.3	244
Turnip (mashed)	6.8	1.9	180	1.7	1.6	306
Potato (boiled)	18.2	4.0	128	2.4	2.5	307
Squash (mashed)	8.8	6.0	196	1.6	1.6	314
Parsnip (mashed)	10.6	5.0	157	2.0	2.4	314

importance in causing dental caries is to carry out long range dietary studies in human subjects. However, until the significance of the decalcification potentials are more firmly established, both theoretical and practical considerations would make it hard to justify such a time consuming and expensive study. It is in resolving dilemmas of this sort that animal experimentation has particular usefulness and in this instance offers good prospects of testing in a relatively simple way the soundness of our hypothesis.

Since caries can be induced in both white rats and hamsters by diets similar to those associated with caries in man, either species seemed suitable for testing purposes. The advantage in using rats was their ability to survive broad changes in diet, which is well established. However, this seemed to be more than offset by the knowledge that caries found in human subjects is more readily produced in hamsters.

In a preliminary run, both rats and hamsters were used but an oversimplified diet caused such a high mortality that the study had to be abandoned prematurely. However, that study did confirm the belief that the greater caries susceptibility of the hamster made it more suitable for these experiments, and it also pointed to dietary modifications which were used.

Caries Production in Hamsters • To test the relation between the decalcification potentials of foods and caries production in hamsters, foods with widely different decalcification potentials were selected as the principal dietary constituent for the animals. The test foods used were graham crackers and oil-sprayed crackers with a control of white bread. After crumbing by a commercial bread manufacturer, these foods, which comprised 60 per cent of the ration, were mixed with the following basic dietary ingredients: powdered milk, 20 per cent; wheat germ, 10 per cent; cellulose, 5 per cent; alfalfa, 4 per cent; sodium chloride, 1 per cent.

Fifty 20 to 30 day Indiana bred hamsters were selected from nine litters and distributed according to their litters and sex into three groups. Each group was divided into male and female subgroups.

The diet was fed in unlimited quantities to the three groups of animals and no restrictions were placed on water consumption. Screen bottom metal cages were used and weighings were made. The diets seemed to maintain the hamsters in good health and the loss of only two animals during the period of the experiment demonstrated the superiority of the feeding procedure over that used in our preliminary study. All weight gains were steady in each group. The differences between the average weight gains of the animals, Group 1 which was fed graham crackers, 63 Gm., Group 2 which was fed white bread, 50 Gm., and Group 3 which was fed oil-sprayed crackers, 25 Gm., suggests possible differences in the nutrient qualities of the three diets.

After 86 days on the special rations,

Table 12 • Average caries in hamsters on different foods

	Graham crackers Group 1 (17 animals)			Oil-sprayed crackers Group 2 (16 animals)			White bread Group 3 (15 animals)		
	Molars affected	No. of cavities	Caries score	Molars affected	No. of cavities	Caries score	Molars affected	No. of cavities	Caries score
Male	10	21	47	9	14	25	8	11	8
Female	9	12	16	8	11	14	7	9	5
Male + female average	10	16	32	9	12	19	7	11	7

the animals were sacrificed and the heads fixed in Formalin. After 24 hours in the fixative, the jaws were separated and dissected, and the teeth examined under a binocular microscope and scored for caries according to Keyes'[15] method. The findings are recorded in Table 12. The differences between the caries figure of the animals on the different diets are not striking, although the finding that the graham crackers produce most caries offers some support for the hypothesis, that the decalcification potentials of foods are an index of their caries-producing potentialities. Among possible reasons why the correlation was not more definite is the possibility that groups of animals showing the low weight gain were inadequately nourished by the diet and that they attempted to compensate by continuous eating which would, of itself, tend to elevate the caries figures.

The only conclusion which can be drawn is that there is an indication of a correlation between caries activity in hamsters and the decalcification potentials of the major dietary constituent, but that refinements of the procedures used in the animal studies are needed before final conclusions can be drawn.

FACTORS DETERMINING DECALCIFICATION POTENTIALS

In commenting on the decalcification potentials of the various foodstuffs which were tested (Tables 4 to 11), it was pointed out that the variations found resulted from both differences in the retention of the foodstuffs and in the amounts of acid formed from the food. It was suggested that the differences observed might be related to the carbohydrate, fat and salt contents of the foods, to their texture or the length of time they remained in the mouth. In attempting to decide on the relative importance of different factors in regulating decalcification potentials it is important to examine these possibilities more fully. In addition, it is necessary to determine the extent to which the findings made on one or two subjects apply to larger groups of individuals. Studies on these points are recorded hereafter.

Effect of Carbohydrates • Since this study was initiated primarily for the purpose of determining the effects of carbohydrate foods on caries causation, it obviously was necessary to give full consideration to possible effects which variations in the amount or nature of the carbohydrates themselves have on decalcification potentials. With this objective the total carbohydrate figures which were determined for each foodstuff as part of the test procedure were supplemented with a measurement of the amount of readily soluble carbohydrates in each foodstuff (Tables 4 to 11). An examination of any of these tables indicates that there is no consistent relation between the total carbohydrate or readily soluble carbohydrate content of the foods and either the amount of acid produced from them or their retention in the mouth.

This can be exemplified by the data in Table 4. It can be seen that egg noodle, containing 71 per cent total and 9 per cent readily soluble carbohydrate, gives a lower acid-production figure at both 4 hours and 24 hours than does whole wheat bread which contains 47 per cent total and 6.5 per cent readily soluble carbohydrates. Similar lack of consistency can be found in all of the other food groups. Obviously, it must be concluded that the acid-production figures are not primarily determined either by the total or readily soluble carbohydrate content of the foods. That the food retention figures are independent of the total carbohydrate content of foods can also be demonstrated by a study of the same table. Egg noodle and zwieback, which contain the

15. Keyes, P. H. A method of recording and scoring cross carious lesions in the molar teeth of Syrian hamsters. J. D. Res. 23:439 (Dec.) 1944.

Table 13 • Effect of fat content on decalcification potentials of "laboratory cakes"

Fat %	$C(H_2O)$ %	Retention mg.	Acid production 4 hr.	Acid production 24 hr.	Decalcification potential
Peanut oil					
0.0	65	116	1.7	1.8	197
23.0	50	103	1.9	2.1	196
Peanut oil (no baking powder)					
0.0	65	135	1.2	1.5	162
23.0	50	107	1.1	1.8	118
Lard					
9.0	59	89	1.3	1.5	116
23.0	50	69	1.4	1.7	97

same total percentage of carbohydrate (71.3 per cent) give food retention figures of 16 and 29 mg., respectively. That the readily soluble carbohydrate has no greater influence is indicated by the finding that zwieback and potato bread, which showed almost identical percentages of soluble carbohydrate (23.4 and 23.6 per cent) gave almost fivefold difference in retention figures. A study of the other tables will multiply the examples of the lack of correlation between the carbohydrate figures and acid production or food retention.

Effect of Varying Constituents • To determine the extent to which the content of fat or other constituents in foods influence their decalcification potentials, food mixtures were compounded and cooked in the laboratory using a basic formula which made it possible to vary the concentrations of various ingredients within a wide range. The laboratory cakes which were baked for this purpose were made according to the following recipe:

152 Gm. flour	156 Gm. sugar
48 Gm. fat	124 Gm. milk
40 Gm. egg	4 Gm. baking powder
	4 Gm. salt

The sugar and fat were blended together. The egg which had been beaten was added. The flour, baking powder and salt were mixed and added alternately with the milk. The cake was baked at 375°F. for 30 minutes. The resultant laboratory cakes were distinctly palatable and permitted changes to be made in the amounts of fat, salt, baking powder and sugar without any culinary difficulty.

Effect of Fat • After cooling, tests of the decalcification potentials of the laboratory cakes were determined in the usual way. The findings are presented in Table 13. It seems that foods with a high fat content are retained in the mouth less than those with a low content.

A comparison was also made to determine whether there were differences in the effectiveness of various fats in reducing food retention figures. The results of this test (Table 14) indicate somewhat less retention with animal than with vegetable fats. However, the differences are not sufficiently marked to justify drawing any definite conclusions on this point.

Effect of Salt • To indicate whether the differences observed in retention of salted and unsalted crackers (Table 6) can be attributed to salt alone, laboratory cakes were prepared which differed only in respect to their salt content. Table 15 records the findings. It can be noted that the cakes containing salt were retained in the mouth to a lesser extent than those without salt.

Effect of Texture • A casual comparison of the amounts of food adhering to the teeth after eating foods of various textures offers evidence that this factor is important in determining its retention. To investigate whether foods made of the same ingredients will differ if the texture alone is changed, laboratory cakes were prepared which differed only in that baking powder was used to give one a lighter texture than the control cake which had no baking powder. Table 15 shows the result of this test. It seems apparent that a change of texture such as can be brought about by the addition of baking powder will reduce food retention.

Food Retention • It has been suggested that the significance of the decalcification potentials as indexes of the caries-producing potentialities of foods might be influenced by the period of food retention in the mouth. This also would be true of differences in food retention from mouth to mouth. To indicate whether there was a relationship between the immediate food retention figure on which the decalcification potentials were based and retention over a longer period of time, comparisons of food clearances were made in several mouths. This was done by having each subject carry out repeated chewings of the test foods. When the subject felt that swallowing was complete he set an interval timer, and the teeth were cleaned with an atomizer at chosen periods thereafter and food recoveries measured in the usual way. The results of these tests are presented in Table 16, and are presented graphically in the chart. It can be noted that while the initial retention figure for bread is higher than that for bread and butter in all mouths, the speed of clearance of bread and butter is somewhat slower than is that of bread. However, since by far the greatest amount of clearance of these foods takes place within the first five minutes after completion of eating, it is felt that the immediate food retention figure provides the best basis for calculating decalcification potentials.

A comparison between the retention of a variety of different foodstuffs in five different subjects is given in Table 17. It will be noted that there was a fair degree of similarity between food retention in the different mouths, some foods giving consistently higher figures than others. A wide deviation observed in one instance may indicate an inability of some mouths to eliminate certain types of foods. From this data it would seem that so far as retention figures are concerned, foodstuffs with high retention figures in one mouth are likely to give high figures in others and that conclusions drawn from

Table 14 • Comparison of "laboratory cakes" containing different fats

Fat %	$C(H_2O)$ %	Retention mg.	Acid produced in 4 hrs.	Decalcification potential
Lard cake				
23.0	50.0	69	1.4	100
9.0	59.0	89	1.3	120
Butter cake				
9.0	59.0	103	1.6	167
Spry cake				
9.0	59.0	120	1.8	217
Corn oil cake				
9.0	59.0	107	1.9	205
Peanut oil cake				
0.0	59.0	116	1.7	197

Table 15 • Comparison of "laboratory cakes" containing baking powder and salt

Fat %	$C(H_2O)$ %	Baking powder %	Salt %	Retention mg.	Acid produced in 4 hrs.	Decalcification potential
Peanut oil cake						
9.0	59.0	0.9	0.0	116	1.6	191
9.0	59.0	0.0	0.0	135	1.5	204
Lard cake						
9.0	59.0	0.9	0.0	89	1.3	120
9.0	59.0	0.9	0.8	66	1.3	82
Spry cake						
9.0	59.0	0.9	0.0	120	1.8	217
9.0	59.0	0.9	0.8	87	1.8	157

a reasonable group of test subjects for a given foodstuff will have some validity for other subjects. Since the acid-producing capacity of salivas may vary, this conclusion relates only to food retention and does not necessarily apply to the decalcification potentials.

Acid Formation in Different Salivas • Because decalcification potentials are derived from acid production in saliva as well as food retention figures, it is of interest to know whether the salivas of different individuals have the same capacity to produce acid from given foodstuffs. To test this point several foodstuffs were tested in as many as 40 different salivas. The results obtained with three foodstuffs, each of which was tested in eight different salivas, are given in Table 18. It is apparent that broad differences exist. This suggests that the salivary factor of an individual may have a greater importance than the food retention factor in determining the decalcification potential of food in his own mouth. It does not, hower, lessen the value of decalcification potential, or more particularly the retention figure of foods as an index of their caries-producing potentialities; it merely means that this potential will be exaggerated or reduced by an unknown factor which represents the acid-producing capacity of each individual's saliva. However, until the relative concentration of foods and saliva which actually participate in the process of acid formation in the mouth is better known, it would be unwise to draw definite conclusions in this area.

Hot and Cold Foods • A subjective impression that hot and cold foods seemed to be retained in the mouth to different extents made it seem desirable to test this point. Accordingly, a variety of foodstuffs were eaten both hot and cold, and food retention figures determined thereafter in the usual manner (Table 19). While the differences are not great, it does appear that cold foods are retained less than are hot foods.

CONCLUDING COMMENTS

The findings presented support our original hypothesis that it might be possible to demonstrate and measure differences in those properties of foodstuffs which are associated with their capacity to produce dental decay. Insofar as very wide differences have been demonstrated in the retentivity of foodstuffs in the mouth and definite, though smaller, differences between the capacities of carbohydrate foods to give rise to acid in the presence of saliva, the basic purpose of this undertaking has been successfully achieved. However, because the decalcification potentials of foods are influenced more by

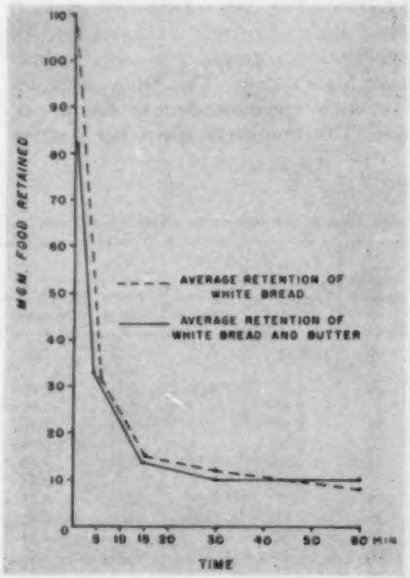
Table 16 • Retention of bread and bread and butter at various time intervals

Subject	Food	Mg. retained after chewing				
		0 min.	5 min.	15 min.	30 min.	60 min.
E.C.	Bread	98.0	27.2	16.0	12.1	6.7
	Bread and butter	78.0	21.7	19.5	13.0	12.2
B.G.B.	Bread	106.0	27.6	16.3	14.0	7.5
	Bread and butter	77.0	15.9	8.5	9.1	9.3
F.B.	Bread	114.5	41.3	14.2	9.8	8.9
	Bread and butter	91.0	31.4	11.9	9.2	8.3

the wide range of retention figures than they are by acid production in the mouth, reservations must be maintained as to the direct proportionality between the decalcification potential figures of foods found and their capacity to give rise to dental decay. It is possible the relation with either acid production or food retention may be more direct than it would be with the decalcification potential. This point obviously needs more study. The result of the study in hamsters in which foods of different decalcification potentials were tested for caries-producing potentialities gives reason for doubt. As has been pointed out, however, the results of animal experiments must be interpreted with care and at the present time there is no reason for believing that foods necessarily have identical effects in caries production in both man and animals.

A number of interesting findings relating to foods in the various groups studied have been commented on in relation to the tables of results (Tables 4 to 11), and there is no point in repeating such comments at this time except perhaps to emphasize one or two salient points. Among these can be noted the broad range of results obtained with the various food groups. For instance, it was somewhat surprising to find that in the fruit group there were foods, such as apples, which gave extremely low decalcification potentials, and figs and dates which gave tremendously high figures. The observation that some of the vegetables gave extremely high acid productions and decalcification potentials comparable to those given by desserts was also unexpected. Similarly, the finding that at least one type of candy gave a decalcification potential lower than many foods which had been considered more or less harmless to the teeth suggests that a more critical appraisal of the relative caries-producing capacity of different candies is in order.

It was interesting to find direct correlations between fat and salt content of foods and their retention figures, and to find indications that the method of processing foods, such as the difference between mashed and boiled potatoes, might have a bearing on their caries-producing potentialities. In other words, it becomes apparent that there are many factors op-



Average retention at different time intervals of bread vs. bread and butter

Table 17 • Foods retained in different mouths

Subject number	Fig bar mg.	Corn soy bean cereal and milk mg.	Bran cereal and milk mg.	Apple pie mg.	Butter-flavored cookies mg.	Fudge cookies mg.	White bread mg.	Cinnamon Melba toast mg.
1	287	202	160	154	127	125	98	93
2	—	213	—	—	—	132	115	—
3	—	258	185	161	—	—	106	278
4	289	—	—	—	130	—	95	—
5	322	—	—	—	164	—	128	—

erating to influence food retention on the teeth, its rate of fermentation in the mouth and its probable capacity to produce dental decay. The findings emphasize the point, which is important, that these proportions are not dependent on the carbohydrate content or soluble carbohydrate content of a food alone.

Finally, thought must be given to considering whether at this stage these findings can be put to any practical use so far as the control of dental decay is concerned. This hinges on a decision as to whether any of the findings made justify recommending the substitution of food which the studies indicate have a low decalcification potential for others which have high ratings. This study indicates that such recommendations are justifiable. This opinion is given not because the numerical values attached to the findings bear any direct relation to the amount of caries which will be produced but simply because there is no alternative method of indicating the caries-producing potentialities of foodstuffs which are made readily available on the table or in the stores. On this account and because both food retention and acid production in the mouth are known to be related to dental decay production, the decalcification potential which reflects both these measurements is, at least, a safe guide for the selection of foods which should prove to be less productive of dental decay. It should be emphasized that while it is our ultimate hope that future studies may substantiate our findings, it would be doing an injustice both to our studies and to the patients concerned if any

Table 18 • Acid formation by different individuals from three foods

Subject number	0 hrs.			4 hrs.			24 hrs.		
	Oil-sprayed cracker	Graham cracker	White bread	Oil-sprayed cracker	Graham cracker	White bread	Oil-sprayed cracker	Graham cracker	White bread
8	0.18	0.12	0.12	1.01	0.97	0.84	1.51	1.75	1.66
			0.15			1.26			2.19
9	0.11	0.06	0.11	0.70	0.70	0.69	2.00	2.20	2.15
	0.10		0.15	0.90		0.87	2.43		2.26
11	0.18	0.09	0.22	1.16	1.59	1.68	2.06	1.95	2.51
	0.16			0.74			2.05		
13	0.24	0.10	0.21	1.13	0.84	0.94	2.13	2.13	1.83
	0.16			0.94			2.30		
15	0.19	0.09	0.16	1.25	1.72	1.22	1.95	2.12	1.62
16	0.12	0.09	0.26	0.58	1.70	0.98	1.81	2.48	1.97
	0.09			1.14			2.09		
20	0.34	0.18	0.21	1.42	0.85	1.09	2.08	1.61	1.72
	0.22			1.46			2.51		
22	0.15	0.16	0.14	1.36	1.46	1.41	2.94	2.96	2.53
	0.08			0.96			2.33		

quantitative effects on dental caries were projected from our present data.

SUMMARY

Studies were undertaken for the purpose of showing whether carbohydrate foodstuffs differed sufficiently in caries-producing potentialities to make substitution of one food for another a practical method of reducing the activity of dental caries.

For this purpose, methods were devised for measuring the retention of carbohydrate foods in the mouth and the amount of acid formed from them in saliva. The product of these two measurements was designated the decalcification potential of the food, and this was used as a tentative index of the caries-producing potentialities of foodstuffs.

Determinations of the decalcification potentials for 96 common carbohydrate foods representing breads, cereals, crackers, cookies, desserts, candies and sodas, fruits, and vegetables showed sufficiently wide variations within each group of foods to give considerable overlap from one group to the other.

Table 19 • Comparison between retention of hot and cold foods

Food	Mg. retained		Difference based on cold retention
	Hot	Cold	%
Oil-sprayed cracker	5*	44	14.0
Oil-sprayed cheese cracker	4	40	7.2
Boiled rice	89	81	10.0
Squash	214	196	9.1
Parsnip	165	157	5.0
Turnip	198	180	10.0
Cooked carrot	3	2	50.0

A preliminary attempt to determine whether the decalcification potentials of foods were related directly to the amount of dental caries in hamsters gave indefinite results.

Studies which included tests on laboratory cakes prepared with known ingredients indicated that texture, fat, or salt content influenced the decalcification potential more than did the carbohydrate content.

Different salivas varied in the amount of acid they formed from food solutions.

Ulcers • Ulcers of the stomach and the duodenum constitute a serious medical and surgical problem. These conditions or a history of them was reported for one out of every 250 young men examined for military service in the peace-time draft. On the basis of the findings of the National Health Survey (1935-1936), there would now be about 400,000 persons with peptic ulcer in the United States, but autopsy studies indicate that the actual number of cases is much larger. *"Recent Trends in Peptic Ulcer," Statistical Bul. Metropolitan Life Insurance Company 30:6, July 1949.*

Nonsurgical reduction of the labial frenum with and without orthodontic treatment

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An unfortunately high percentage of median diastemata are incorrectly diagnosed as caused by the superior labial frenum and its attachment. More frequently the activating cause of an excessively prolonged attachment extending through to the median or incisive papilla is due to one of the following: (1) missing or undersized lateral incisors or their overly delayed eruption; (2) protrusion of the premaxilla caused by such habits as thumbsucking, finger-sucking, mouth breathing, tongue-thrusting and lip-biting; (3) supernumerary teeth; (4) an ankylosed central incisor; or (5) flared or rotated central incisors.

Other causes are anodontia, macroglossia, excess tooth material in the mandibular arch, a ligamentous synarthrosis in the cleft between the two halves of the superior maxilla; the particular position of the incisal foramen and its relation to the premaxillary suture, enlargement of the maxillary suture or even periodontitis.

Various methods of surgical reduction of the frenum have been described. However, most orthodontists are of the opinion that only in rare cases is a frenotomy necessary. Joule[1] states:

> At the Orthodontic Clinic of Columbia University, a policy of frenectomy when absolutely necessary is generally observed. In a superficial study of about 2,000 cases of malocclusions on record in this Clinic . . ., of every 100 cases there were about 5 definite specimens of spaced centrals in which it was felt that the frenum was exerting some degree of influence.

He also reports that frenectomy had been resorted to in only 8 cases.

Although I used surgical resection successfully in the 1920's and 1930's, the procedure has not been found necessary in the last more than 1,000 cases.

The following cases illustrate the development, from early childhood to adolescence, of a normal frenum without orthodontic interference. Various causes of median diastemata which were associated with prolonged attachment of the frenum with the incisive papilla and were successfully reduced by orthodontic procedures are also illustrated.

In Figure 1 is illustrated the normal recession of the labial frenum from the sixth to the twelfth year of age. In the deciduous dentition the frenum extends to the alveolar ridge, but with the forward and downward development of the bones of the face the attachment recedes until normally, in the adult, it extends downward to a point approximately 5 mm. above the gingival line.

Presented before the Section on Orthodontics combined with the Section on Oral Surgery, ninetieth annual session of the American Dental Association, San Francisco, October 19, 1949.

1. Joule, William R. The upper and lower frenums and their relationship to diagnosis and treatment in orthodontics. Thesis written at Columbia University.

Eight examples of various causes of diastema with prolonged attachment of the frenum with the incisive papilla follow.

MISSING LATERAL INCISORS

Figure 2 illustrates an extreme case, caused by absence of lateral incisors, in a child 8 years of age. A 3 mm. reduction in the enlarged frenum was accomplished in six months by closing the median diastema. In cases of this kind it is necessary to hold the central incisors together for about a year while the frenum gradually resorbs. It is advisable to follow this procedure before resorting to surgery as otherwise scar tissue forms and has the

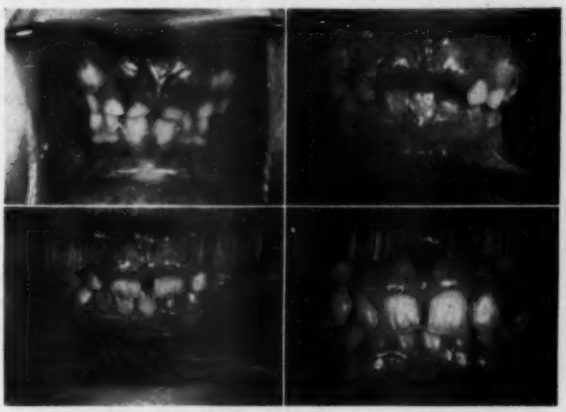


Fig. 1 • Normal recession of the labial frenum in child 6 to 12 years of age

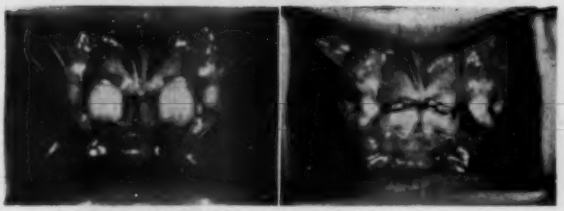


Fig. 2 • Partial reduction of the frenum in 6 months by closure of a median diastema caused by missing lateral incisors

Fig. 3 • Simple and rapid reduction of the frenum with a removable appliance in a case of undersized lateral incisors

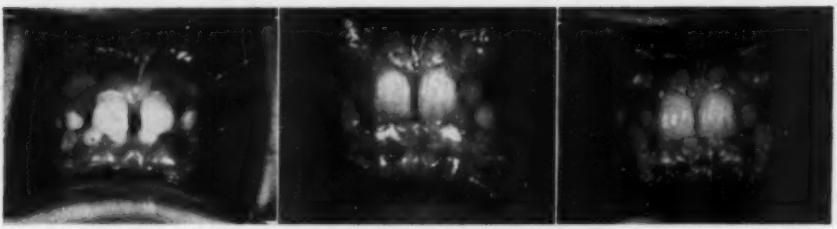


Fig. 4 • Reduced attachment by closure of a median diastema caused by unerupted lateral incisors in a child 8 years old, permitting eruption at 10 years of age

same effect as the attachment of the frenum.

UNDERSIZED LATERAL INCISORS

In Figure 3 is illustrated a less extreme case than that shown in Figure 2. The diastema was caused by undersized lateral incisors and reduction was accomplished by a removable appliance which would be useful for similar treatment in an adult.

DELAYED ERUPTION OF LATERAL INCISORS

Closure of a median diastema caused by delayed eruption of the lateral incisors in an 8 year old girl is shown in Figure 4. Reduced attachment of the frenum and

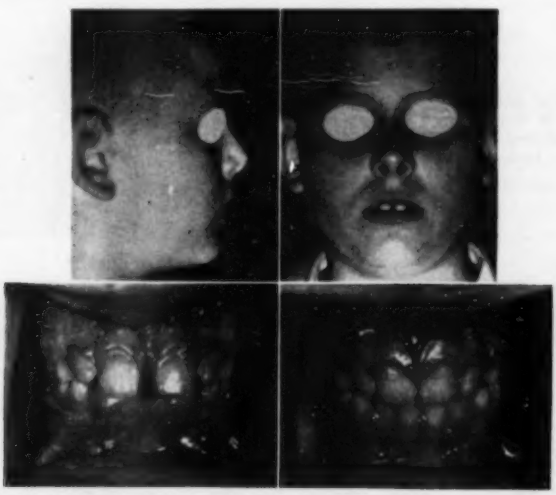


Fig. 5 • Successful reduction of the frenum by orthodontic correction of the malocclusion in conjunction with correct breathing exercises

closure of the diastema allowed eruption of the lateral incisors at 10 years of age.

Protrusion of the premaxilla due to thumbsucking or finger-sucking is usually followed by mouth breathing, tongue-thrusting or lip-biting.

MOUTH BREATHING

Figure 5 illustrates a typical case resulting from mouth breathing. Despite a broad face, the nasal areas are undeveloped. Correction required training in nasal breathing in conjunction with orthodontic treatment.

LIP-BITING

Lip-biting (Fig. 6) creates the so-called "snaggle tooth deformity" by outward pressure on one central incisor and inward pressure on the other. This permits the attachment of the frenum to remain as a heavy band through the interproximal space.

SUPERNUMERARY TEETH

Supernumerary teeth frequently occur in the median area and cause a diastema. In Figure 7 is illustrated a case in which supernumerary teeth were removed and the space was successfully closed with concurrent reduction of the frenum. The interesting feature of this case, which is an extreme one, is that after six years, at the age of 24, the central incisors had begun to overlap slightly rather than to relapse.

BLOW IN EARLY CHILDHOOD

A blow in early childhood resulted in an ankylosed central incisor with a concomitant continuation of the infantile attachment of the frenum. After the appliance was placed (Fig. 8) a facing was soldered to the lock cap, primarily for psychological purposes since the child was highly sensitive. Before so doing there was constant breakage but thereafter the child was so proud of his new tooth that there was no further difficulty.

FLARED AND ROTATED CENTRAL INCISORS

Flared and rotated central incisors can result from various causes, but they are

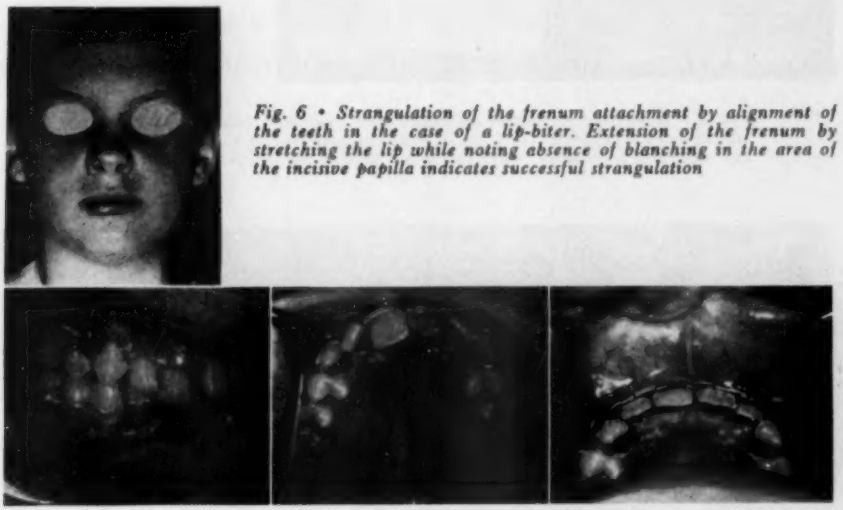
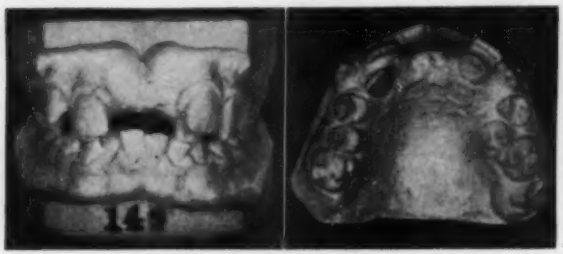
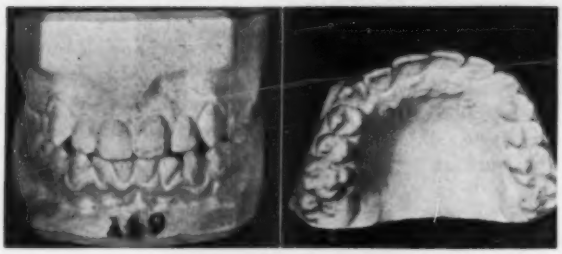


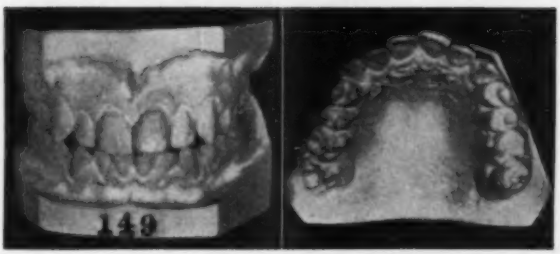
Fig. 6 • Strangulation of the frenum attachment by alignment of the teeth in the case of a lip-biter. Extension of the frenum by stretching the lip while noting absence of blanching in the area of the incisive papilla indicates successful strangulation



A. Case before treatment



B. Case after treatment



C. Case 6 years after treatment, when patient was aged 24

Fig. 7 • Reduction of continuous attachment caused by extreme median diastema resulting from 7 supernumerary teeth. Note the tendency of the central incisors to overlap slightly 6 years after treatment, when patient was 24 years of age

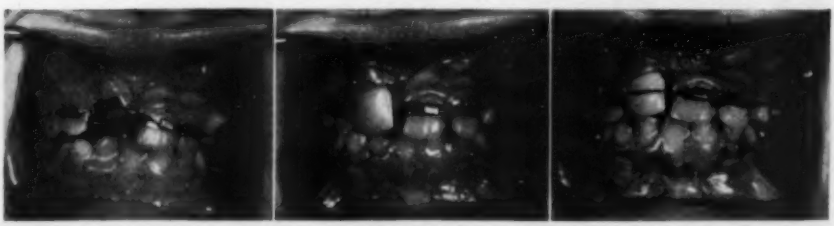


Fig. 8 • A temporary restoration as a psychological adjunct in the treatment of an ankylosed central incisor

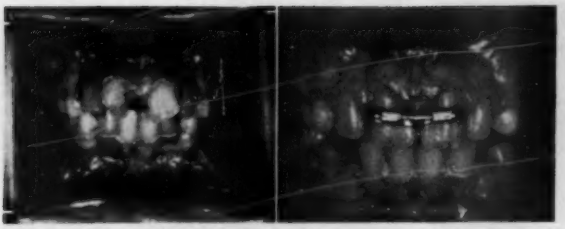


Fig. 9 • Retention in alignment after treatment of badly flared and rotated central incisors with accompanying reduction of the frenum

usually accompanied by the maintained attachment of the frenum with the incisive papilla. Since the retention of the teeth in alignment over a considerable period is necessary anyway, especially if the roots of the central incisors are malformed which is frequently the case, the frenum has well subsided before stability is obtained (Fig. 9).

In nearly 30 years of practice, it has been found that surgical reduction of the labial frenum is rarely necessary, and that unless the operator is well versed in the procedure the frenum should be left alone. Too often excessive removal permits the upper lip to curl unattractively.

CONCLUSIONS

Evidence indicates that the prolonged attachment of the labial frenum to the incisive papilla is more often than not the result and not the cause of median diastemata. Frenotomy therefore should be resorted to only after all other activating causes have been removed.

49 Market Street

Value of the occlusal roentgenogram in locating impacted mandibular third molars

George W. Matthews, M.S., D.D.S., Birmingham, Ala.

The position of the crown of the impacted mandibular third molar and its relation to the second molar is extremely varied. The usual periapical view on a dental film gives only two dimensions and is apt to be misleading and confusing due to superimposition of structures through which the rays pass. For this reason it is desirable to have a roentgenogram made at a right angle to the periapical view which will give the third dimension, or depth. This is known as the occlusal view because the central ray is directed from below perpendicular to the occlusal surfaces of the lower molar teeth.

Stereoroentgenography has been used to show the third dimension but it is felt that the use of the occlusal roentgenogram is not only simpler, but will give a more positive and accurate localization.

Even though a general practitioner might not want to remove the impacted

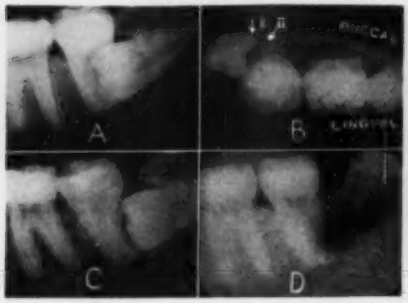


Fig. 1 • A: Periapical roentgenogram of an impacted right mandibular third molar. The second molar had been condemned by a previous consultant. B: Occlusal view. The arrow indicated by I shows the direction of the central ray when roentgenogram A was made, and the arrow marked II shows the angle of the ray to obtain the view shown in C. The postoperative roentgenogram is shown in D

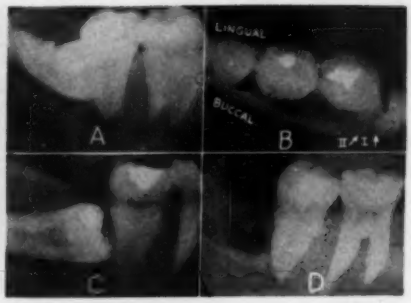


Fig. 2 • A: Periapical roentgenogram of an impacted left mandibular third molar. The second molar had been condemned by a previous consultant. B: Occlusal view. The arrow indicated by I shows the direction of the central ray when roentgenogram A was made, and the arrow marked II shows the angle of the ray to obtain the view shown in C. The postoperative roentgenogram is shown in D

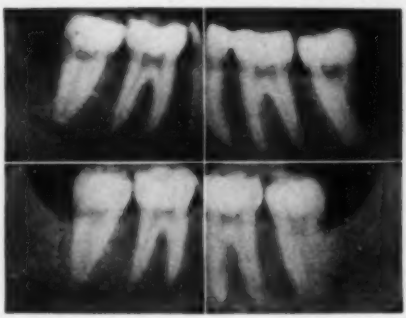


Fig. 3 • Upper: Postoperative roentgenograms of left and right sides made August 17, 1948, approximately six months after operation. Lower: Roentgenograms of left and right sides made January 24, 1950 showing perfect bone regeneration and no injury to the distal surfaces of the second molars

third molar himself, he is frequently called upon to give an opinion regarding the advisability of either removing or retaining the second molar and it is best to avail himself of all the diagnostic aids he possibly can before advising his patient. Such a case is illustrated here. Figures 1A and 2A show periapical views of horizontal impactions of the mandibular third molars of a young woman patient about 25 years of age. She had been to another oral surgeon who condemned the second molars and told her they would have to be removed. The occlusal views shown in Figures 1B and 2B revealed that each third molar was in a buccolingual position and was in contact with the second molar at the distobuccal angle. When the central ray passed through perpendicular to the buccal surfaces of the lower molars, as indicated by arrow I, the buccal cusps of the third molar seemed to be superimposed over the second molars (Figures 1A and 2A).

After seeing the occlusal views, new periapical roentgenograms were made at an angle of 45 degrees to the buccal surfaces of the lower molars, as shown by arrow II. These roentgenograms are shown in Figures 1C and 2C. The prognosis for the second molar on the right side (Fig. 1) was not as favorable as that for the second molar on the left (Fig. 2), but the patient was advised as to the possibilities and it was decided to try to save the second molar. The lower left third

molar was removed on February 23, 1948, and the lower right on March 29. The sectioning method was used in each operation. This not only eliminated any downward pressure of the third molar on the inferior dental canal, which was in close proximity on each side, but also avoided gouging or prying with an elevator against the distobuccal surface of the root of the second molar, which sometimes results in loss of the second molar or an extremely sensitive condition for a long time after the operation.

In each instance, the postoperative course was remarkably uneventful. There was a slight paresthesia on the right side but little postoperative pain and neither second molar was sore to percussion or extremely sensitive to thermal changes as had been anticipated. Figures 1D and 2D were made immediately after each operation. Figure 3 above shows roentgenograms of each side made August 17, 1948, and Figure 3 below shows roentgenograms made January 24, 1950. There was no tenderness, soreness or sensitivity of the second molars, and no clinical evidence of a residual pocket on the distal aspect.

SUMMARY

Saving a lower second molar, which is in good, functioning occlusion with an upper second molar, is well worth the extra effort expended in making a few more roentgenograms and the slight difficulty in removing the third molar without removing the second.

1922 Tenth Avenue, South

Influence of service in Armed Forces on incidence of gingivitis

J. J. Pindborg, L.D.S., Dr. Odont., Copenhagen, Denmark

During the years 1945 to 1948 the author examined 9,577 men in the Danish forces. These included 6,960 newly conscripted sailors, 1,216 newly conscripted soldiers, 859 soldiers with five months' preliminary training completed and 542 reconscripted sailors. The Danish Armed Forces are composed partly of personnel for whom the service is a career, and partly of conscripted personnel serving for about one year. Conscripted personnel can be reconscripted some years later and usually will not hold leading ranks in the Navy. The examinations of newly conscripted sailors and soldiers afforded an opportunity of ascertaining the incidence of gingivitis in a number of civilian patients, as sailors and soldiers were examined on the day they entered the service. Examinations later in their service made it possible to form an estimate of the influence of service in the Army or Navy on the incidence and type of gingivitis.

The Royal Danish Navy, Medical Corps; the department of histology, National Dental College of Denmark and the Danish National Health Service.

Table 1 • Frequency of gingivitis in newly conscripted sailors

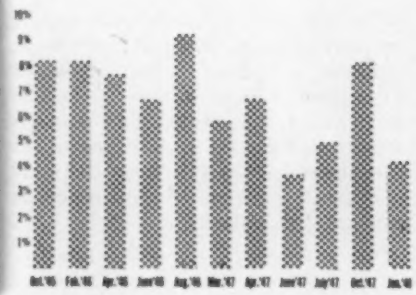
	Number	Per cent
Full dentures in upper and lower jaws	32	0.5
Normal gingiva	1,815	26.1
Chronic simple marginal gingivitis	4,596	66.0
Ulceromembranous gingivitis:		
Incipient	160	2.3
Acute	88	1.2
Subacute	180	2.6
Chronic	54	0.8
Other forms of gingivitis	35	0.5
Total	6,960	100.0

Table 2 • Frequency of gingivitis in newly conscripted soldiers

	Number	Per cent
Full dentures in upper and lower jaws	13	1.1
Normal gingiva	223	18.4
Chronic simple marginal gingivitis	909	74.6
Ulceromembranous gingivitis:		
Incipient	30	2.4
Acute	10	0.8
Subacute	24	2.0
Chronic	3	0.3
Other forms of gingivitis	5	0.4
Total	1,217	100.0

CLASSIFICATION OF GINGIVAL CONDITIONS

The gingival conditions were classified as normal gingiva, chronic simple marginal gingivitis, ulceromembranous gingivitis and other types of gingivititis. Ulceromembranous gingivitis was further subdivided into four types: incipient, acute, subacute and chronic. Incipient ulceromembranous gingivitis was considered as the precursor of the acute condition. The symptoms are erythema and edema of the interdental papillae, and there is a tendency to necrosis of the tip of the papillae. This type, often called "pre-Vincent's," most frequently passes into the subacute form. Acute ulceromembranous gingivitis needs no further comment. In the subacute form the symptoms are less pronounced, the interdental papillae being only partly ulcerated, but swollen and of a bluish red color. The fourth type is chronic ulceromembranous gingivitis, characterized by more extensive ulceration of the interdental papillae, as a consequence of which the gingiva is higher on the buccal and lingual surfaces than interdentally.



Relation between seasons and percentage of sailors having ulceromembranous gingivitis

All the examinations were made by the author so that variability due to several examiners was avoided.

GINGIVITIS IN NEWLY INDUCTED MILITARY PERSONNEL

Table 1 shows the incidence of gingivitis found in the newly conscripted sailors on the day of their entering the service. It is surprising that 73 per cent of the male youths (aged 17 to 28 years), who were best equipped physically, should have gingivitis. Ulceromembranous gingivitis, (including all four types), occurred in 6.9 per cent of the men. Possibly the increase in ulceromembranous gingivitis observed in the population at the end of World War II was to some extent responsible for this high figure.

The 6,960 sailors were conscripted at various times of the year, and therefore it was possible to determine whether there

was a seasonal variation in the incidence of ulceromembranous gingivitis. The graph shows the incidence of ulceromembranous gingivitis in relation to the seasons. It was found that the greatest incidence of the condition occurred in the months August to October. The frequency of ulceromembranous gingivitis decreased with the passing of time after the war.

Table 2 shows the frequency of gingivitis in newly conscripted soldiers on the day of their entering the service. The slight decrease in the occurrence of ulceromembranous gingivitis and the slight increase in the occurrence of chronic simple marginal gingivitis may be due to the fact that the soldiers were recruited from other sections of the population and other trades than were the sailors.

INCIDENCE OF GINGIVITIS

Examination of Sailors and Soldiers on the Day of Conscription and Later in the Military Service • In only one group of sailors was it possible to make four examinations in the course of eight months. Examination was made at the time of conscription, two months later on completion of preliminary training, after four months of service and again after eight months of service. Because the sailors were often transferred to other places, it was not possible to make the four examinations on the same subjects. Table 3 shows the incidence of gingivitis at the four examinations. The two months of preliminary training apparently did not affect the frequency of gingivitis. After two months service in ships, however, ulceromembranous gingivitis appeared almost three times as frequently. The increase occurred particularly in the groups which had had incipient and subacute forms and still persisted when examination was made in the eighth month of service.

The preliminary training in the Army lasts five months. Of the 1,216 newly conscripted soldiers 839 were examined on completion of preliminary training. The results are given in Table 4. It will be seen that after the first examination 34 (1 + 33) new cases of ulceromembranous gingivitis developed, and that in the interval between the first and second examination, 15 cases of ulceromembranous gingivitis had developed into chronic simple marginal gingivitis.

First Examination of Sailors and Soldiers After Several Months of Military Service • A group of 542 sailors in various coastal camps were examined five months after conscription. The sailors had previously

Table 3 • Frequency of gingivitis in sailors on day of conscription and after 2, 4 and 8 months of service in the Navy

	Day of conscription		After 2 months' service		After 4 months' service		After 8 months' service	
	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent
Full dentures in upper and lower jaws	3	0.4	3	0.4	2	0.6	1	0.3
Normal gingiva	182	26.4	166	24.1	64	18.2	76	24.1
Chronic simple marginal gingivitis	456	66.2	474	68.8	221	63.0	180	57.1
Ulceromembranous gingivitis:								
Incipient	3	0.4	4	0.6	26	7.4	8	2.5
Acute	14	2.0	5	0.7	3	0.9	4	1.3
Subacute	22	3.2	28	4.0	27	7.7	33	10.5
Chronic	8	1.2	8	1.2	7	2.0	11	3.5
Other forms of gingivitis	1	0.2	1	0.2	1	0.2	2	0.7
Total	689	100.0	689	100.0	351	100.0	315	100.0

served for six months in 1943. After the surrender of the Germans in Denmark in May 1945, they were reconscripted and placed in coast defense installations left by the Germans where hygienic conditions were often extremely primitive.

Results of this examination (Table 5) show that the incidence of ulceromembranous gingivitis reached the high level of 19.6 per cent which is comparable to the incidence after four to eight months' service in the Navy (Table 3).

After the end of World War II the Danish Army took over the guarding of the Danish-German frontier. Eight hundred and fifty-nine soldiers were examined on arrival from 9 different camps, after having had five months' preliminary training. Of these men, 688 were examined again five months later. The remaining 171 had either been transferred, taken ill or been disbanded. Table 6 shows the incidence of gingivitis at the two examinations.

During the five months' service at the frontier, the incidence of ulceromembranous gingivitis had more than doubled. An examination of the incidence in particular camps showed that the soldiers in Camps 8 and 9 were most severely affected (Table 7). Fifty-seven (3 + 54) new cases of ulceromembranous gingivitis had developed, and 17 previous cases of ulceromembranous gingivitis had developed into chronic simple marginal gingivitis (Table 8).

DISCUSSION

The results suggest that service in the Armed Forces causes a considerable increase in the number of persons with ulceromembranous gingivitis. The increase in this series was most pronounced after the sailors and soldiers had finished preliminary training. The explanation is, in all probability, that sailors and soldiers are under more efficient supervision as regards both general and personal hygiene while undergoing the preliminary training. When transferred to the military service proper, on board ships, in coast

Table 4 • Frequency of gingivitis in newly conscripted soldiers after five months' preliminary training

A. Incidence of gingivitis at first and second examination

	Normal gingiva	Chronic simple marginal gingivitis	Ulceromembranous gingivitis
First examination	155	645	39
Second examination	148	633	58

B. Distribution of incidence of gingivitis

	First examination			
	Normal gingiva	Chronic simple marginal gingivitis	Ulceromembranous gingivitis	Total
Second examination				
Normal gingiva	115	33	0	148
Chronic simple marginal gingivitis	39	579	15	633
Ulceromembranous gingivitis	1	33	24	58
Total	155	645	39	839

Table 5 • Frequency of gingivitis in reconscripted sailors

	Number	Per cent
Full dentures in upper and lower jaws	9	1.7
Normal gingiva	82	15.1
Chronic simple marginal gingivitis	339	62.5
Ulceromembranous gingivitis:		
Incipient	19	3.5
Acute	41	7.6
Subacute	32	5.9
Chronic	14	2.6
Other forms of gingivitis	6	1.1
Total	542	100.0

defense installations, in camps, and so forth, personal hygiene gradually decreases, and the effect is reflected in an increased incidence of ulceromembranous gingivitis.

It still has to be determined whether ulceromembranous gingivitis is a communicable disease. The author believes that the condition is communicable. This would account for the fact that in some camps there was a definite increase in the incidence of ulceromembranous gingivitis, while in others there was practically no increase (Table 7). The food and its preparation were the same in all the camps.

Among other predisposing causes of ulceromembranous gingivitis are (1) preexisting gingivitis and (2) the consumption of tobacco. Among the 91 new cases of ulceromembranous gingivitis among the soldiers (Tables 4 and 7), 87 developed from a pre-existing chronic simple marginal gingivitis. In only 4 instances the condition developed in a healthy gingiva.

The predisposing effect of tobacco may be demonstrated by the observation that among the 57 persons who had developed ulceromembranous gingivitis (Table 8) 56 were smokers and only 1 was a nonsmoker. Since 12 per cent of the subjects examined were nonsmokers it can be surmised that smokers are attacked by ulceromembranous gingivitis approximately seven times as frequently as are nonsmokers.

The following prophylactic measures should be introduced in the Armed Forces:

1. All cases of ulceromembranous gingivitis should be diagnosed and treated on the day of entering the service.
2. Regular inspection of the condition of the gingiva should be undertaken.
3. Instruction to sailors and soldiers in a painstaking oral and dental hygiene should be given.

SUMMARY

Seven thousand five hundred and two sailors and 2,075 soldiers in the Danish Armed Forces have been examined. On the day of entering the service the inci-

Table 6 • Frequency of gingivitis in soldiers at an interval of five months

	First examination		Second examination	
	Number	Per cent	Number	Per cent
Full dentures in upper and lower jaws	13	1.5	11	1.6
Normal gingiva	205	23.9	118	17.2
Chronic simple marginal gingivitis	590	68.7	472	68.6
Ulceromembranous gingivitis:				
Incipient	16	1.9	20	2.9
Acute	8	0.9	16	2.3
Subacute	17	2.0	34	5.0
Chronic	2	0.2	11	1.6
Other forms of gingivitis	8	0.9	6	0.8
Total	859	100.0	688	100.0

Table 7 • Frequency of ulceromembranous gingivitis in 9 camps as shown in examinations at an interval of five months

Camp no.	Incidence of ulceromembranous gingivitis			
	First examination		Second examination	
	Number	Per cent	Number	Per cent
1	1	4.0	0	0
2	8	6.7	14	12.8
3	9	7.3	9	8.1
4	4	3.3	12	11.1
5	2	2.4	5	10.2
6	4	3.5	8	8.5
7	6	8.1	7	10.4
8	5	4.8	17	20.5
9	4	3.7	9	19.2
Average frequency of ulceromembranous gingivitis		5.0		11.8

Total number of soldiers examined: First examination, 859; second examination, 688.

Table 8 • Frequency of gingivitis in soldiers as shown in examinations of five months' interval

A. Incidence of gingivitis at first and second examination

	Normal gingiva	Chronic simple marginal gingivitis	Ulceromembranous gingivitis
First examination	159	475	41
Second examination	118	476	81

B. Distribution of incidence of gingivitis

	First examination			
	Normal gingiva	Chronic simple marginal gingivitis	Ulceromembranous gingivitis	Total
Second examination				
Normal gingiva	108	10	0	118
Chronic simple marginal gingivitis	48	411	17	476
Ulceromembranous gingivitis	3	54	24	81
Total	159	475	41	675

dence of chronic simple marginal gingivitis in sailors was 66.0 per cent, and of ulceromembranous gingivitis 6.9 per cent. The highest incidence of ulceromembranous gingivitis occurred from August to October. After some months of service the frequency of ulceromembranous gingivitis in the Navy rose to three times the original number, and in the Army to twice the number. The author believes that ulceromembranous gingivitis is a communicable disease. Among predisposing causes, the significance of a preexisting gingivitis and the consumption of tobacco is established.

Universitetsparken 4

Function, prime object of restorative dentistry; a definite procedure to obtain it

Arne G. Lauritzen, D.D.S., Seattle

It has been emphasized for many years that the whole dental apparatus should be recognized as a complex chewing machine, an organ of mastication and digestion which performs a definite digestive function. The primary aim of dentistry is to establish and maintain proper function of this organ. Accordingly the study of occlusion and articulation of teeth must be considered one of the most important sciences in dentistry.

There is a need for a more biological approach to restorative dentistry. Occlusal disharmonies and other functional disturbances of the bite should be recognized and diagnosed routinely in order to institute a treatment producing a well functioning bite. The factors constituting the complete masticatory organ, which include the cheeks, lips, tongue, single teeth, the rows of teeth, the mucous membranes, all periodontal structures, jaws, muscles, ligaments and temporomandibular joints, are, during function, stimulated most favorably when they are in a specific harmonious mutual relation, or physiological equilibrium.

Three therapeutic methods to achieve this relation are (1) orthodontic measures, (2) restorative dentistry and prosthetic measures and (3) incisal and occlusal selective grinding. These methods are not sharply defined but often overlap. In adult patients the latter two are the most frequently applicable.

If occlusal corrections, either by grinding or by restorative dentistry, are to be made in order to establish better function, certain fundamentals must be considered. These fundamentals are applicable in artificial, natural and mixed dentitions.

MANDIBULAR MOVEMENTS

Mandibular movements are controlled mainly by the temporomandibular joint including its anatomic shape, the meniscus and capsular ligaments, muscles and ligaments and the occlusal and incisal contacting surfaces of the teeth.

In order to make the movements of the mandible a little better understood a few salient points must be mentioned. The condyle is not in the fossa but on the posterior slope of the articular tubercle. The temporomandibular joint is a hinge joint with a movable socket. All hinge joints have collateral ligaments. In the temporomandibular joint the inner fibers of the capsular ligament form distinct collateral ligaments from the meniscus to the mandible. This means that wherever the mandible goes the meniscus goes. The upper portion of the external pterygoid muscle inserts into the anterior part of

Presented before the American Academy of Restorative Dentistry, San Francisco, October 15, 1949.

the capsule. In this region the capsule is attached to the meniscus. The lower part of this muscle inserts into the neck of the condyle anteriorly. There is no muscle which can retrude the meniscus per se.

The physiology is easier understood when the temporomandibular articulation is regarded as two separate joints, the menisco-condylar joint and the temporo-meniscus joint. The only motion that is made, or can be made by the menisco-condylar joint is that of opening and closing; a purely rotational hinge movement. The temporo-meniscus joint is the movable socket of the menisco-condylar joint. The temporo-meniscus joint performs all sliding movements and carries the meniscus and condyle to all eccentric positions. This sliding takes place between the meniscus and the posterior slope of the articular tubercle.

It has been shown by McCollum,[1,2] Beyron[3] and others that opening and closing motions in all patients can be made as pure rotational movements. The exact axis or hinge-axis of this movement is located in the region of the condyles although its position varies with different individuals. This kinematic hinge-axis can be located only when the mandible is in its hinge relation to the skull. In all patients the anterior teeth can be separated at least 12 mm. by a purely rotational movement when the mandible is in the hinge relation.

This purely rotational movement is performed solely by the hinge joint (the menisco-condylar joint) and there is no motion in the temporo-meniscus joint; consequently the external pterygoid muscles must be fully relaxed.

According to Robinson,[4] the anatomy and histology of the temporomandibular joints definitely indicate that they are not stress bearing areas. This means that the dental arches should take up the heavy stress and it indicates the importance of harmonizing the function of the teeth with the individual's pattern of temporomandibular joint movement.

REST POSITION, VERTICAL DIMENSION AND FREEWAY SPACE

In the nomenclature pertaining to the relation of the mandible to the skull there is a conglomeration of terms that are often misinterpreted and that cause misunderstanding and confusion. As commonly and carelessly used, they include: rest position, rest relation, occlusal rest position, freeway space, vertical dimension, rest vertical, occlusal vertical, centric position, physical centric, centric relation, centric maxillomandibular relation, mandibular centricity, functional centric, physiological centric, true centric occlusion and many other terms.

It is not necessary to discuss all these terms but for purposes of clarity a few of them shall be defined.

Rest position is defined by Niswonger[5] as, "that position in which the mandible is involuntarily suspended by the reciprocal coordination of the muscles of mastication and the depressor muscles with teeth separated." It is a postural position at a given length of the muscles, dictated by muscle physiology. According to Thompson,[6] it is established before any of the teeth have erupted, it is not altered by the eruption of the teeth and a high degree of stability of the rest position exists after extraction. The statement that the rest position is an absolute constant cannot be made because of the normal aging process and consequent

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change in posture. This factor however is not too important.

The only scientific way to determine rest position is by taking several cephalometric roentgenograms of the patient, checking them by superposition to see if they are all identical. Rest position usually is measured in millimeters from nasion to gnathion and is sometimes referred to as rest vertical dimension.

The occlusal vertical dimension is usually referred to as vertical dimension. In the general terminology the term vertical dimension is the facial dimension vertically when teeth, bite-blocks or other restorations are in centric occlusion.

The interocclusal or intermaxillary space existing between rest position or rest vertical and vertical dimension or occlusal vertical is known as the freeway space. A freeway space of at least 2 mm. measured in the incisal region should always be present. If the freeway space is encroached upon it will reestablish itself at the cost of the supporting structures. The ideal occlusal vertical dimension equals rest position or rest vertical minus two to three mm. in the incisal region.

The dangers encountered by overopening a bite seem evident. Great caution should be employed in establishing a new vertical dimension. An encroachment on the freeway space will result in the failure of any dental treatment because of the violation of the physiologic limit of tolerance.

In rest position, the condyles generally are anterior to their most posterior position. This fact illustrates the fallacy of utilizing this position for establishing centric relation. Rest position can be utilized in the establishing of vertical dimension only.

CENTRIC RELATION; CENTRIC OCCLUSION; TRUE CENTRIC OR HINGE OCCLUSION

Simpson[7] says: "Centric relation of the mandible to the maxillae is the key to all functional positions and relations. This relation is the starting point or basis of all engineering in the building of properly constructed artificial dentures." Centric relation, or better hinge relation, is the starting point in all bite analysis. Casts must always be oriented on any articulating device in their exact hinge relation.

Centric occlusion as commonly referred to is that contact relation into which the mandible moves from the physiologic rest position. It is indicated only by intercuspation of teeth under maximum contact. This centric occlusion is often a habitual centric occlusion, a convenience bite or a pathologic occlusion.

True centric occlusion, or better hinge occlusion, is an occlusion in which the intercuspation of teeth is in harmony with mandibular centricity or closure on the hinge-axis. It is the terminal stop of the mandible, with an acceptable vertical dimension, when it has closed with a purely rotational movement on its hinge-axis. This corresponds to an occlusion in which the condyles are in the most retruded position in their skull relation from which eccentric movements can be made.

Patients with a natural dentition always will close their jaws in centric occlusion. As judged conservatively by the author this centric occlusion, in 50 per cent of all patients, is not a true centric, or hinge occlusion but a convenience bite. In such cases the intercuspation of teeth which determines the occlusion is not in harmony with closure on the hinge-axis. The occlusion is thus mostly a protrusive, a lateral protrusive or a lateral position. Fortunately, it is seldom that the condyle, on one or both sides, is ever forced posteriorly from its hinge relation. McLean[8] uses the term centric interference

7. Simpson, H. Registration of centric relation in complete denture prosthesis. J.A.D.A. 26:1682 (Oct.) 1939.

8. McLean, D. W. Pathologic occlusion: a major clinical problem. J.A.D.A. 31:1586 (Dec.) 1944.

to describe a very slight slide of the teeth and the term "excentric" intercuspation to designate a heavier slide from the pure rotational closure into centric occlusion.

The result of such a pathologic occlusion is that too heavy stress is imposed on the supporting tissues. Because of muscular force, the mandible tries to move posteriorly into the correct skull relationship, but is prevented from doing so by the intercuspation of the teeth. The resulting force is transmitted through the teeth to the supporting tissues. The direction of this stress often will result in a typical resorption of the bony support. The interproximal bone is not designed to take up excessive force. As the muscle force tries to reposition the mandible posteriorly the lower teeth receive a mesially directed thrust. This condition produces a definite pattern of bone resorption; the bone on the mesial side of the tooth showing a deeper loss than the bone on the distal side of the neighboring tooth. The interproximal cortical layer of bone is missing, indicative of a process of gradual resorption. Oblique lines of mandibular bone resorption are so typical that the diagnosis of an habitual convenience occlusion often can be made solely by viewing the roentgenograms.

These types of habitual convenience occlusion will give unphysiologic patterns of closure. Furthermore, eccentric movements will be unphysiologic as the masticatory slides must pass through the pathologic centric occlusion.

Whenever a patient places his jaws in a so-called retrusive position, he actually places them in true hinge relation. This closure may feel strained because the patient has to keep his teeth in contact on inclined planes, which requires heavy muscular action and is very tiresome. The patient usually remarks that this is not the natural way to close his jaws.

When casts mounted on an adjustable articulator with the mandibular cast oriented correctly to the upper cast and closing on the hinge axis are studied, the cases with an habitual convenience occlusion will have a number of facets on inclined planes which make the mandible slide from the true hinge relation into habitual convenience occlusion. These facets are all highly polished when studied in the mouth. In the majority of cases the location of the facets will be typical; namely, on mesial upper inclines and on distal lower inclines. The mesial incline of the lingual cusps of the upper first bicuspids is their most frequent location.

The facets appear on these surfaces because the patient, in attempting to close the mouth in mandibular centricity, hits these inclines unconsciously as he tries to close the jaws in correct hinge relation. The following slide into habitual convenience occlusion produces the facets. The facets, because of their typical location, can be produced only by a slide from a so-called retrusive closure into the convenience bite or by a slide from the convenience bite posteriorly into the hinge relation.

This habitual pattern of closure is immediately changed after occlusal correction enables the patient to close the jaws in so-called retrusive position without cuspal interference. The patient then is actually closing the teeth into hinge occlusion in accordance with the physiologically correct pattern for jaw closure.

ORIENTATION OF CASTS TO INSTRUMENT

Dentists sometimes do not realize that artificial teeth cannot be articulated in the mouth. An articulator is thought of merely as a convenient mechanism on which to set up the teeth. Correct mounting of casts on an adjustable articulator is imperative for articulating teeth properly.

The axial centers of the condylar movement should be determined with a kinematic face-bow or, better termed, a hinge-bow rigidly attached to the man-

dible. When the fully relaxed mandible performs opening and closing motions, in some cases guided by the operator's hand, the condyle rods of the hinge-bow should be adjusted until their points coincide with the right and left centers of the rotational opening axis. These axial centers, or condyle points, should be marked on the skin either with indelible pencil or by tattooing.

HINGE-BOW REGISTRATION AND TRANSFER

In conventional practice the hinge-bow registration has been made only to the two condyle points. The orientation on the instrument has been guided only by the correct relation to the hinge-axis and an arbitrary horizontal setting. For instance the incisal line of the upper central incisors should be at the same height as a marking on the incisal pin. For diagnostic purposes, however, it is mandatory to use a definite skull plane for the orientation of casts on the articulator. Orthodontists usually orient their casts to the Frankfort horizontal plane introduced by Simon.[9] This plane is located through the superior margin of the external auditory meatus on both sides of the skull and the orbitale on one side.

This skull plane would be impractical to use. Instead, a similar plane is chosen, namely, the orbital-axis plane. This is provided by the two condyle points and orbitale on one side. The anterior point is the same as in the Frankfort horizontal plane and the posterior points differ only a few millimeters from that plane.

In order to obtain an orientation to orbitale, a second lock screw should be added to the hinge-bow. After registration has been made the routine way, an orbital pointer pin should be set to touch the point orbitale and be locked in position. The hinge-bow registration must be checked for exactness as the condyle rods must coincide with the condyle points.

When the upper cast is transferred to the articulator, the condyle rods are attached to the terminals of the condylar shaft. The upper and lower jaw members are set parallel. The hinge-bow is now lowered or raised, until the orbital pointer pin is at the same level as the condylar axis.

When this type of orientation is used, the upper jaw member in the articulator is parallel to the orbital-axis plane in the head. In this way, all factors of articulation can be studied properly as all inclinations are viewed and measured in their relation to a definite skull plane. The value of this method of orientation cannot be overemphasized because congruent terminal measurements in both head and articulator can be obtained only in this way.

ORIENTATION OF LOWER CAST IN RELATION TO UPPER

After the upper cast has been mounted correctly from the hinge-bow registration in its correct relation to the hinge-axis, the lower cast should be oriented to the upper from a centric wax record. This record is taken while the mandible is closing with its purely rotational hinge-axis movement and with a jaw separation which does not permit tooth contact. The records should be made of an extra hard base plate wax with two or three thicknesses of wax folded over a thin tin-foil strip as reinforcement. The wax should be very soft when the records are taken. It should be softened in water heated to 140° C. A strip of this wax should be placed on the occlusal surfaces of the left and right mandibular teeth. The operator should control the movement of the patient's jaw with his thumb and index finger on the patient's chin. With the mandible completely relaxed the patient should close his jaw very

9. Simon, P. W. The necessity of gnathostatic diagnoses in orthodontic practice. J.A.D.A. 15:22 (Jan.) 1928.

lightly into the soft wax following the pure hinge-axis movement.

The wax records should show only cusp indentations. A full impression of the occlusal surfaces of any tooth will usually prevent the casts from seating properly in the records.

When the records are placed on the casts they should show stability; they should touch tooth structure only. If a record touches any area of soft tissue, this part of the record should be cut off. When the centric record is acceptable, the lower cast should be mounted on the articulator from this record in assumed mandibular centricity.

Centric check records taken in the mouth, chilled and transferred to the instrument will verify the correctness of the mounting. Only true centric records can be reproduced easily. This check is most important. The wax record should be trimmed with a very sharp knife until the contact areas of the cusps of the upper teeth in the wax record can be seen clearly. If no discrepancies are visible to the eye during the closing motion of the instrument, the mounting can be accepted as correct.

When the records are removed, the approach of the casts to each other is identical with the closure on the hinge-axis. This basic position must be reproduced with the highest degree of exactness since it is the most important step in the orientation of casts or artificial dentures to an articulating device. This procedure must be done meticulously, and remountings are frequent even for the experienced operator.

ECCENTRIC MOVEMENTS

In the natural dentition, the eccentric movements of the mandibular slide are dictated mainly by the occlusal surfaces and cusp relations of the teeth irrespective of whether these relations are or are not in harmony with the guidances of the temppromandibular joint. The following type case is seen again and again in natural dentition. In such a case interdigitation will be an habitual rather than a correct closure; actually a protrusive relation of 1 to 1.5 mm. When the patient is asked to move his jaw laterally he will slide the mandible nicely into these movements from his habitual closure. After the mandible has been repositioned into hinge-occlusion by selective occlusal grinding, the patient will close the teeth repeatedly and with no effort into this correct position. Before corrections have been made for lateral movements, it is only with great difficulty and with heavy guidance from the operator that the patient will be able to slide the jaw laterally from hinge occlusion. Corrections by grinding make it possible for the patient to slide the teeth without interference along the correct paths directly from hinge occlusion into the lateral components. However, the patient will not make these movements at once. When asked to move the jaw into lateral excursions, the patient will invariably move it forward to its former habitual closure and make the lateral movements according to the former habitual pattern. At the next appointment, usually a week later, the picture will have changed. Asked now to move the mandible laterally, the patient will slide it into left or right lateral movement directly from the hinge occlusion. When the patient is asked to move the jaw in lateral excursions along the former habitual pattern, he will be able to do so only with the guidance of the operator or before a mirror. This shows that the habitual pattern will be overcome when the patient is given the possibility of moving the mandible according to a physiologic pattern.

When positional records are required in order to set the condylar guidances individually, the exactness of lateral records is questionable. These often will be influenced by the habitual pattern and therefore they will not be true lateral but combined lateral-protrusive records. Thus

they are of no value. The protrusive record however will be a correct positional record because this movement can be controlled. Any incorrect habitual pattern in protrusive position can be overcome easily by guiding the jaw into the desired position.

The protrusive record is taken from a straight protrusive position of 4 to 5 mm. The records should never be bitten through. From this protrusive record the condylar guidances should be set and a check-bite should be taken in the mouth to verify the correctness of the setting. The protrusive records should be as thin as possible provided an instrument is used in which the condylar guidance is a part of the lower jaw member. If the condylar guidance is a part of the upper jaw member this precaution will not be necessary.

Lateral settings are set arbitrarily to 15 degrees.

After the instrument has been set this way a comparison of what is seen on the instrument and in the mouth should be made. The relative fidelity with which the instrument imitates the different positions within the functional ranges should be checked visually. About 10 per cent will require a special setting of the instrument for lateral movements, where a heavy Bennett shift makes the rotating condyle retrude slightly behind the hinge-axis.

FACTORS AND LAWS OF ARTICULATION

After the casts have been oriented to the articulator and the instrument has been set to imitate individual jaw movements, the analysis of the required function must be based on the factors of articulation. Following are the five factors of articulation:

1. CO—COndylar guidance (inclination of) steep or flat
2. I—Incisal guidance (inclination of) steep or flat
3. OP—Occlusal Plane (inclination of) steep or flat
4. OC—Occlusal Curve (curvature of) deep or shallow
5. C—Cusp height (cusp inclination) steep or flat

CO is the declination from horizontal of the path followed by the condyle head when it moves forward from its hinge terminal position along the posterior slope of the articular tubercle. CO is measured in the degrees of the angle formed between the condyle path and the orbital-axis plane.

I is the declination from horizontal of the path which the incisal edges of the lower anterior teeth follow when they are in contact with the lingual surfaces of the upper teeth as they slide from their hinge position into an end to end bite. I is measured in the degrees of the angle formed between the incisal path and the orbital-axis plane.

OP. The occlusal plane herein referred to shall be a mandibular plane as it is easier to visualize than a maxillary plane. The three points chosen to establish the occlusal plane are the tips of the two highest cusps on the last mandibular molars and the contact point of the lower central incisors. The inclination of the occlusal plane is likewise viewed in relation to the orbital-axis plane.

OC. The occlusal curve also has been called the compensating curve. The OC is referred to as a curve located on a sagittal plane and touching the tips of the lower buccal cusps. The OC can be viewed in a transverse vertical plane too, touching the tips of the lower buccal and lingual cusps. In this projection it is identical with the Wilson curve.

Geometrically the occlusal plane is a trapezium. The arcs formed by the occlusal curves subtend the trapezium. The distance between the lines of the trapezium and the arcs determines the depth of the occlusal curves.

C. Cusp height, or correctly termed cusp inclination, is the inclination of the side of the cusp in relation to its base.

Condylar guidance is the only fixed

factor of articulation. It cannot be changed by the dentist or dental restorations. The four other factors are all controllable factors which can be changed and modified by dental operations.

When a harmonious relationship between these factors of articulation is present there is equilibrium of articulation. Hanau[10] points out the interrelation of these factors to each other. On the premise that equilibrium is present he explains how the change of any one factor of articulation requires changes in from one to all other factors. He terms these interrelations the laws of articulation.

LAWS OF ARTICULATION

An increase of the inclination of the condylar guidance requires:

1. An increase of the curvature of the occlusal curve.
2. An increase of the inclination of the occlusal plane.
3. An increase of cusp height progressively towards the posterior.
4. A decrease of the inclination of the incisal guidance.

An increase of the curvature of the occlusal curve requires:

5. An increase of the inclination of the incisal guidance.
6. A decrease of the inclination of the occlusal plane.
7. A decrease of cusp height progressively towards the posterior.

An increase of the inclination of the occlusal plane requires:

8. An increase of the inclination of the incisal guidance.
9. A decrease of cusp height equally, or nearly so.

An increase of the inclination of the incisal guidance requires:

10. An increase of cusp height progressively towards the anterior.

Each of these ten laws of articulation can be transposed into three new laws. Thielemann[11] has developed the following formula which is easy to remember:

$$\frac{CO \times I}{OP \times OC \times C} = \text{Equilibrium of articulation}$$

It must be understood that this formula is only a formula to indicate the compensatory changes required, and that actual values for the factors of articulation cannot be inserted in the equation.

The knowledge of these laws of articulation is important because they form the basis for treatment. The approach to any correction of occlusion should be through a rearrangement of the factors of articulation. The following example illustrates this point.

A patient has an overbite and a minimum of freeway space so that no change in vertical dimension can be made successfully. In protrusion only the anterior teeth are in contact. What is wrong? The factor I is too great to be in harmony with the other factors. Accordingly, it must be reduced by grinding. This grinding might give the desired contact in the posterior region. But if this is not possible and if as much grinding has been done as esthetics and tooth anatomy will permit, what can be done then? The product of the factors in the numerator is still too great to give a true equation and the factor CO is unchangeable. Accordingly, the factors in the denominator must be increased. The OP can be increased by shortening the upper posterior molars and building up the occluding lower molars. The OC can be increased by shortening the lower teeth in the region of the second bicuspid and first molar and increasing the length of the occluding upper teeth. Finally the factor C can be increased by building more pronounced cusps. Thus by rearranging the factors of articulation it is often possible to solve the problem without resorting to the

10. Hanau, R. L. Full denture prosthesis: intraoral technique for Hanau articulator model H., ed. 4. Buffalo, N. Y., The Author, 1930.

11. Thielemann, K. Biomechanik der Paradentose. Leipzig, Hermann Meusser, 1938.

often dangerous process of increasing the vertical dimension.

FUNCTIONAL DISTURBANCES: SLIDING INTERFERENCES

The well functioning bite (1) provides effective and good mastication, (2) maintains this function, and (3) contributes to the health of the tooth, its supporting tissues and the whole masticatory apparatus including the temporomandibular joint.

The opposite of the well functioning bite is a disturbed articulation which has the following characteristics: (1) sliding interferences, (2) lack of normal sliding movements, (3) too heavy stress or stress in a wrong direction on single teeth or groups of teeth and (4) lack of stress and function of single teeth or groups of teeth. There are two types of disturbed articulation, primary and secondary.

Primary disturbances are those which have originated during the development of the bite. An example of this type is the deep bite with either the heavy overbite or the pronounced overjet. Secondary disturbances are those which have developed in the fully erupted dentition. Generally these are caused by extractions and sometimes by faulty dentistry.

Many of these disturbances, as pointed out by Thielemann,[11] will produce definite typical growth patterns and definite changes in the factors of articulation. Where there is a one-sided sliding interference the patient will chew only on one side of the mouth. This habit causes changes to occur on the opposite side. A typical example of this is the mouth in which the upper left third molar has been extracted. As the lower left third molar has no opponent it will extrude. This condition causes the patient discomfort when he moves the jaw to the right and therefore he chews all of his food on the left side. Inactivity causes the following changes to occur on the right side of the mouth:

1. Both upper and lower right central incisors, lateral incisors and cuspids extrude. Later on they will tend to migrate labially and separate. This creates asymmetrical incisal lines.
2. Step formations in the occlusal alignment occur between the right cuspids and the first bicuspids.

If a double sided sliding interference is present, food is masticated mainly by chopping motions without normal masticatory slides. In such cases the typical growth pattern is characterized by (1) pronounced convexities of the incisal lines with symmetrical design, (2) tendency of spacing of anterior teeth, (3) step formations between all cuspids and first bicuspids and (4) very deep occlusal curves sagittally. These growth patterns are frequent and so typical that they are readily recognized.

Sliding disturbances may be caused by mechanical interference such as the extrusion of a lower third molar. They may be a reflex action resulting from the buccal eruption of an upper third molar which causes pain in the soft tissues by lateral movement. These disturbances may or may not be combined with the already mentioned faulty closure into a convenience bite.

Cuspal trauma, sometimes mentioned as the cause of loosening of a single tooth or a group of teeth, is not a good term as it is frequently the secondary consequence of a sliding interference in another part of the mouth.

The treatment of disturbed articulation should create freedom from sliding interferences; that is, sliding movements of the tooth surfaces without interference and cuspal coordination which will promote active sliding movements of the mandible. It should produce distribution of occlusal force which means simultaneous occlusal force on as many teeth as possible, and the direction of occlusal force as nearly as possible along the long axes of the teeth.

OCCLUSAL CORRECTION: PRINCIPLES AND RULES

When occlusal corrections by selective grinding are to be made, there are certain fundamental rules which apply to both the natural and artificial dentition. Schuyler[12, 13] describes these fundamentals.

The first step is to establish a true centric occlusion or a hinge occlusion in which the intercuspation of teeth is in harmony with the closure on the hinge-axis.

All rules mentioned are based on a normal relation of the teeth buccolingually.

Rule No. 1. Premature contacts in centric occlusion are corrected first. The cusp should be ground only if it has premature contact in all 3 eccentric positions; otherwise the fossa should be deepened.

Only the actual tip of the cusp is to be considered in this regard. If the cusps are removed in the correction for centric they will not be present later when they should be utilized in balancing the eccentric positions.

Rule No. 1A. When the mandible must be repositioned to a more retruded position, practically all corrections should be made following the rule MU-DL; that is, reduction of the mesial upper inclines and reduction of the distal lower inclines.

When true centric occlusion has been established it is a definite requirement for the following corrections that teeth should never be taken out of their centric contact, because, if they are, they are going to grow into a new centric contact with the result that new eccentric disturbances develop.

Rule No. 2. Premature contacts in protrusive relation are corrected as the second step, following the rule BU-LL; that is, reduction of the distolingual inclines of the buccal upper cusps, and reduction of the mesiobuccal inclines of the lingual lower cusps.

Rule No. 3. Premature contacts in lateral movements are corrected according to the following rules: (A) On the working side (the side to which the mandible moves), the rule BU-LL is followed; that is, in this step, reduction of the lingual inclines of the buccal upper cusps, and reduction of the buccal inclines of the lingual lower cusps. (B) On the balancing side (the other side) the cusp should be selected carefully. If the upper lingual cusp is selected, its distobuccal incline should be reduced. If the lower buccal cusp is selected, its mesiolingual incline should be reduced. Both cusps should never be ground.

The buccal upper cusps and the lingual lower cusps do not maintain centric occlusion and therefore can be safely ground; but when correction on the balancing side must be made, a very careful study of the relationship of the interfering cusp in centric, protrusive and working relation is imperative in order to select the right cusp for correction.

Typewriter ribbon, no. 10 inking, is used instead of articulating paper to locate premature interferences. Two different colors are used in the correction of eccentric movements. Black is used to locate eccentric interferences. Red typewriter ribbon is inserted between the teeth to determine that centric contact points are maintained when the articulator is in a position of hinge closure. Red markings are frequently superimposed on parts of the black markings. The red markings must never be touched because they represent centric contact points.

It should be emphasized that abrasive paste should never be used for selective grinding. It destroys the established centric occlusion because it cuts the tips of

12. Schuyler, C. H. Fundamental principles in correction of occlusal disharmonies, natural and artificial. J.A.D.A. 22:1193 (July) 1935.

13. Schuyler, C. H. Correction of occlusal disharmony of the natural dentition. New York D. J. 13:445 (Oct.) 1947.

the cusps mainly and only slightly cuts the inclined planes.

In those cases which can be corrected by grinding or in which occlusal grinding should precede mouth rehabilitation, the mounted casts are corrected by knife trimming. An exact record is kept of every knife trim as to tooth and location on tooth surface. This grinding record is later to be followed in the occlusal and incisal selective grinding in the mouth.

In approximately 90 per cent of more than 400 cases of natural dentition which were subjected to this form of bite-analysis and correction by grinding, it was possible to follow the grinding list meticulously as to the exact location of interferences to be ground. If these principles are used in bridgework and large reconstruction appliances, practically no adjustments will be required in the mouth. Many cases with temporomandibular joint disturbances have been successfully treated by the procedures described here. The fidelity with which the properly adjusted articulator will imitate actual jaw movements in the natural dentition is unbelievable. It is possible to check the grinding list against the corrections in the mouth. There has been a tendency to judge the ability of articulators to imitate jaw movements from the conclusions reached by studies in articulation of artificial dentures. A most questionable factor, namely that of displacement of the denture bases, is present in such studies. This factor has been eliminated in this study of occlusion and articulation in the natural dentition.

FUNCTIONAL ANALYSIS, DIAGNOSIS AND TREATMENT PLANNING

McCollum[14] says, "Treatment of any organ must follow a diagnosis which depends on a thorough knowledge of the function of the organ. One of the most important things any surgeon should know about an organ on which he operates is its function and the effect of loss or impairment of this function."

Inasmuch as 95 per cent of all patients with natural dentitions have unphysiologic functional patterns of jaw movements dictated by the shape of occlusal surfaces, malposition of teeth and lack of coordination among the factors of articulation, there is a decided need for the biological approach to restorative dentistry.

In order to diagnose a case properly from a functional point of view, it is imperative to orient casts meticulously on an adjustable articulator of the hinge type. Only thus is it possible to prescribe dental remedies, be these occlusal correction by grinding, restorative or prosthetic dentistry, orthodontics or combinations thereof. The articulator is to the dentist what the microscope is to the histologist or bacteriologist; it is an indispensable auxiliary apparatus which has great diagnostic value in the hands of the careful and experienced man.

If bridgework, larger occlusal reconstruction or changes in the factors of articulation are required, such work should always be sketched out in wax on the mounted casts before any tooth preparation is started. Only in this way is it possible to preview the problems. Preparations need not be remade in order to accommodate for correct cusp relations throughout the full range of mandibular slides.

After such sketching has been made, corrections by grinding, if required, are performed according to the grinding list. All preparations may now be made, and if a hydrocolloid technic is used, a full upper and lower master cast can be made. These master casts should be oriented to the articulator. The case may now be finished in the laboratory with no further try-in. The finished restorations will then be ready for insertion, and if

14. McCollum, B. B. Consideration and treatment of the mouth as an organ of digestion. J.A.D.A. 16:1424 (Aug.) 1929.

meticulously made, will require hardly any corrections.

Restorative dentistry is highly developed technically. Precision casting, perfect fit, beautiful carving, adaptation and polishing are routine procedures. How good are these wonderful inlays and bridges when scrutinized from a biological point of view? In more than 90 per cent of all cases they probably have been constructed so as to repeat and perpetuate the present malfunction of the dental organ. Thus these restorations are actually only filling holes and replacing missing teeth in such a way that they maintain and in many cases aggravate the existing malfunction.

As it is through the correctly correlated occlusal surfaces of the teeth that the mouth performs its principal function, it seems logical that before any work should be placed in the mouth, a proper diagnosis and treatment plan should be made. A functional analysis of the bite is possible only when perfect casts are meticulously oriented on an adjustable articulator and when the dentist bases his analysis on sound fundamental knowledge of jaw physiology and the science of occlusion and articulation. Only by following such exacting procedures is it possible to render to our patients a real biological oral health service that justifies a place for dentistry among the healing professions.

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Fundamental principles involved in partial denture design

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Great advances have been made during the last three decades in the prosthetic phase of dentistry. However, developments in partial denture prosthesis seem to have suffered in comparison to developments in complete denture prosthesis. Some of the reasons why less progress has been made in the development of removable partial dentures are the following:

1. The many difficulties encountered in designing removable partial dentures make it seem simpler to extract the teeth and supply a complete denture.
2. It is impossible to provide a set design and plan of procedure to apply to all the varied cases, as can be done for complete dentures.
3. There is a general feeling among dentists, as well as among patients, that removable partial dentures, at best, are temporary restorations.

Regardless of where the blame is placed, the history of removable partial dentures records far too many failures. These undesirable end results often come about through the simple neglect of, or the heedless omission of, one or more seemingly unimportant items in the plan of procedure. As a result, the removable partial denture branch of dentistry suf-

fers the distinction of being the most neglected and most abused of dentistry's subdivisions.

A partial denture may be defined as that form of prosthesis which supplies one or more artificial teeth and contiguous structures in a partially edentulous arch. A partial denture may be a fixed appliance, cemented to place or it may be removable. A removable partial denture may derive its fixation from either internal (slotted) or external (clasp) attachments.

Some of the sins of omission leading up to the deplorable status of partial denture service are (1) lack of a careful diagnosis, supported by accurate study models and well defined roentgenographs, (2) failure of the dentist personally to survey and design restorations before having them fabricated by the technician, (3) failure to apply the broad fundamental principles of favorable leverage in design, (4) failure to distribute and reduce destructive forces so as to convert them for physiologic stimulation, (5) indifference to the necessity of centric relation, (6) failure to restore all serviceable teeth to normal function before making final impressions, (7) ignoring indispensable denture movement in function, (8) insufficient attention to the importance of a balanced occlusion and (9) neglect to instruct the patient, on the careless assumption that the patient will know fully how to use and care for the new appliance.

The step in clasp partial denture procedures most often neglected or omitted altogether is the "preparation of the mouth, or alterations, before making final impressions." The following items fall under this heading:

1. Making full crowns to restore posterior abutment teeth which are carious at the gingival margin.

2. Correcting, by grinding or with restorations, teeth which are leaning or overcontoured.

3. Providing an occlusal embrasure space, either by judicious stoning of enamel only or by precious metal fillings, where a clasp must be used on the side of the arch presenting a tight, ideal occlusion.

4. Slightly cupping out incisal enamel corners for the reception of an incisal embrasure hook or rest for indirect retention.

5. Preparing rest areas with positive seats for incisal and occlusal stops, either in the tooth structure or in the metallic restorations.

6. Reducing, by surgery, interfering ridge convexities and bulbous tuberosities.

7. Balancing the natural occlusion, so that the occlusion of the appliance can be harmonized with it.

8. Placing complete metal crowns, properly contoured, for clasping on posterior teeth whose surfaces converge occlusally.

9. Properly contouring, by disking, the mesial and the distal proximal enamel aspects of any anterior tooth which is to accommodate a mesiodistal clasp.

10. Preparing crowns or inlays for teeth with excessive long axis inclinations to provide abutment tooth alignment in harmony with other teeth.

11. Reducing surgically remaining occlusal gum tissue or hypertrophied or bulging gingival tissue about teeth to be clasped.

12. Removing a torus mandibularis to make room for a lingual bar.

13. Giving a thorough prophylaxis.

In partial denture construction, at least two of the above named requisites must be observed: the providing of properly shaped support or stop areas and the meticulous cleansing of the remaining teeth. All surgery, extractions, elimination of periodontal pockets, and fixed restorative procedures, when necessary, should be completed before making the final impressions.

To enhance self assurance and to secure the confidence of the patient, it cannot be overemphasized that a careful diagnosis is a prerequisite to any form of treatment. Many appliances are discarded because the dentist did not diagnose the condition properly and plan the appliance carefully.

Three things are necessary in order to diagnose complex cases correctly: study casts mounted on an adjustable articulator, roentgenographs of the patient, and the presence of the patient. From the mounted casts, the mechanics of the case are studied and comparative sizes of the arches, interferences in protrusive and lateral shifts, clearances for rests, possibilities of clasping, probable fulcrum lines, and lengths of leverage are noted. The roentgenographs aid in determining the health of the structures which will give support in function. They also aid in disclosing diseased conditions. Careful examination of the patient obviously lends the most assistance. His age, general health, firmness of remaining teeth, and tone of oral tissues must be noted. Inquiry must be made as to the success of previous restorations and the possibility of his suffering from such diseases as tuberculosis and diabetes. Such a procedure leads the operator in a meticulous, scientific way towards the attainment of his restorative goal. Thorough consideration of any case will determine what type and design of restoration will best serve the patient in the preservation and perpetuation of his remaining dental structures and in promoting his general health.

A word of caution is in order regarding prognosis. The dentist must not promise the impossible. The masticatory apparatus is broken down and crippled when the patient comes to the practitioner therefore the practitioner should not promise results equal to, or better than, normal. If the problems to be met in design and treatment were wholly mechanical, a complete restoration of function might be predicted in chosen cases. But the mechanical phases must be subordinated to the biologic. The success of a restoration is largely dependent on biologic response.

Favorable response of the living tissues over a period of time depends on recognition by the dentist of the necessity for slight denture movement while in function. If this movement is anticipated it can be regulated. This functional denture motion must be accepted as a requirement, controlled by design and converted to favorable physiologic stimulation instead of trauma. Every application of a mechanical principle must be made with special reference to the ability of the supporting teeth, and the more yielding soft tissues, to accept the movement and stresses imposed on them. Favorable forces and physiologic stimulation, which are individual problems with each patient, will enable these structures to bear up indefinitely.

Proper design and adequate support, therefore, are of prime importance. Proper design will create advantages by keeping those heavy stress leverages short which tend to unseat the denture, and keeping the controlling leverages long. Proper design will utilize broad support which will provide normal functional stimulation to all of the hard and soft tissues instead of imposing trauma on them. Such is the ideal, but it is not always possible of attainment.

Most leading men in the field of partial dentures are in agreement on the essentials mentioned up to this point. However, in the consideration of what constitutes correct design and adequate support for free-end based appliances which involve tooth support and engagement combined with ridge support, the literature reveals a long standing and perpetual controversy among the partial denture prosthetists. No suitable one-piece impression material has ever been discovered or synthesized to produce proper functional displacement of the soft tissues in relation to the dense, hard,

relatively stable, teeth. Hence the contention over the best way to utilize and equalize ridge support along with tooth support.

The published articles on the subject of partial denture construction show that the authors may be classified into three groups:

1. Those who believe that ridge and tooth supports can best be equalized by the use of stress-breakers or resilient equalizers.
2. Those who insist on bringing about the equalization of ridge and tooth support by physiologic basing which is accomplished by a pressure impression or by rebasing the denture under biting stress.
3. Those who uphold the idea of extensive stress distribution for the purpose of stress reduction at any one point.

Many scholarly and scientific articles by outstanding members of the dental profession appear in support of each group.

STRESS-BREAKERS

One group of thinkers on the question of how best to equalize stresses where a combination of the tooth and the soft tissue support exists emphasizes the nonresiliency of teeth in an apical direction, and points out that the resiliency of the periodontal membrane is not comparable to the greater resiliency and displaceability of the ridge mucosa. This group condemns the rigid connection of direct retainers to the base, and insists that some type of stress-breaker or stress equalizer be used. Various types of stress-breakers are shown in Figure 1.

Requirements for appliances with stress-breakers are listed as follows: (1) clasps or frictional attachments, (2) some form of stress-breaker, (3) a minimum of tooth engagement and (4) bases of ordinary anatomic form on ridge surface.

The possible advantages of stress-breakers are listed as follows:

1. Resiliency of the stress-breaker added to that of the periodontal membrane makes the sum of the two comparable to the resiliency of the mucosa.
2. A balance between the stress bearing duties of the abutment teeth and ridges is provided.
3. Bone resorption about abutments is prevented as tipping strain is eliminated.
4. Intermittent pressure of the bases massages the mucosa, providing physiologic stimulation which results in thickening of the cortical layer of bone and soft tissue cell proliferation.
5. Stresses are reduced and trauma to abutment teeth is prevented.
6. Stimulation caused by physiologic massage prevents bone resorption and minimizes rebasing.
7. Mouth comfort is improved because of the relative passivity of the denture.

The possible disadvantages of stress-breakers are:

1. Construction of the appliance is more difficult, complex and costly than some other types of appliances. Because of the fragility more servicing is necessary.
2. If the stress-breaker is too weak or too movable, rapid resorption of bone and consequent settling will result.
3. Restoration often is bulky and heavy.
4. Resilient types of stress-breakers frequently pinch the tongue and other lingual tissues.
5. If bone resorption results, abutment-base relation changes, requiring frequent rebasing of the appliance.
6. Some forms of equalizers allow strangulation of tissue distal to the abutments, causing periodontal disease.
7. Because the restoration is movable indirect retention is difficult.
8. The prosthesis is not stabilized against lateral thrusts.

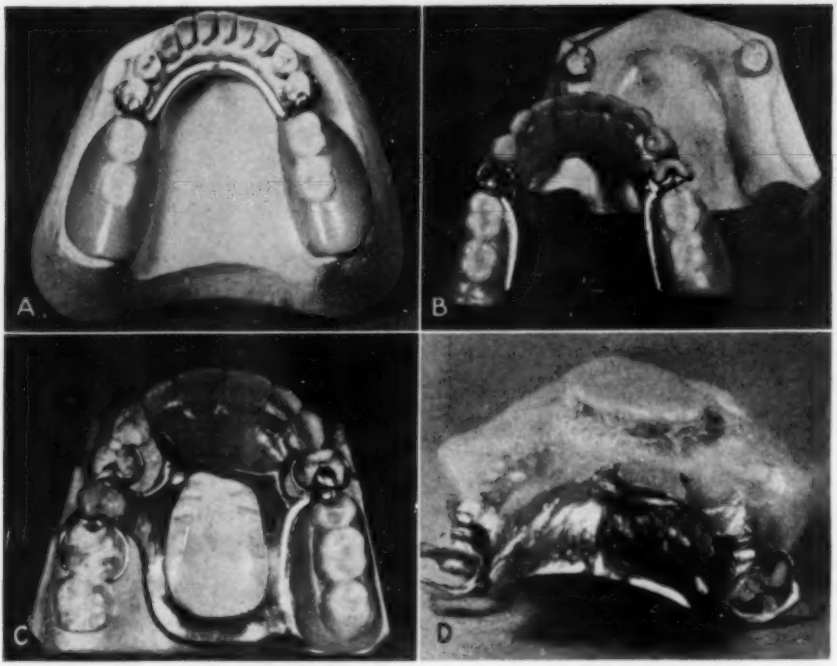

Fig. 1 • A: Conventional stress-breaker, 16 gage round spring wire, attached to lingual bar only at median line. B: A restoration, almost wholly tissue borne, with spring type stress-breakers extending distally from clasps. C: An upper partial denture, stress-breaker placed unilaterally, and combined with tube distal to clasp for better resistance to lateral thrusts. D: A cleft palate appliance with Dresch hinge and slot type stress-breaker

In support of the broken stress principle, Cody[1] says,

Intermittent pressures on saddle areas and absence of continued pressure, causes the rebuilding of bone rather than absorption . . . broken stress on extension saddle cases is a most desirable preventive measure even for the normal case.

Jones[2] adds,

If these devices [stress-breakers] are correctly made, the operator will not only be surprised, but will also be gratified to see how little resorption takes place beneath saddles . . .

McLean[3] says,

In no case should rigid attachments, whether precision or non-precision, be used without means for equalization of the resilient and non-resilient supports. . . . Equalization of the resilient and non-resilient supports is accomplished by interposing between the supporting teeth and the movable denture either resilient metal or movable joints.

Meyer[4] states,

1. Cody, L. G. Broken stress and splinting in the field of partial dentures. J. Colorado D. A. 23:87 (Mar.) 1945.

2. Jones, R. R. A procedure for making a lower partial denture with a spring stressbreaker. J.A.D.A. 29:2154 (Dec.) 1942.

3. McLean, D. W. The partial denture as a vehicle for function. J.A.D.A. 23:1271 (July) 1936.

4. Meyer, F. S. Something new in cusps and sulci analysis, balanced and functional occlusion and stress breakers. J.A.D.A. 23:1204 (July) 1936.

In the act of mastication, the denture is forced against the tissues without any apparent stress on the supporting teeth. When the pressure on the teeth has been relieved . . . the stress-breakers automatically allow the denture to reassume its rest position in relation to the tissues. This consecutive pressure, followed by relaxation, massages the gum tissues and should tend to keep them in a healthier condition.

Neurohr[5] favors stress-breakers by saying,

It is a mistake . . . to take impressions of saddle areas under pressure. . . . When such sustained pressure is incorporated in an appliance, we invite periodontal lesions and abnormal recession of the alveolar process, because of the trauma incurred. Impressions should be taken without compression with the tissues in the passive state. The restoration, however, should be so designed that . . . it will, when the pressure of mastication is brought to bear upon it, [through spring action] distribute this force evenly over the largest tolerable area possible.

van Minden[6] writes,

. . . we must see to it [by breaking stress] that the abutments shall bear only the vertical and lateral stresses that properly should fall on them during mastication. . . . Finally, the case should resume its normal position when relieved from masticating pressure. . . . As a result of the equitable distribution of the masticatory stress over the entire alveolar ridge [through stress-breaking action] . . . the need for rebasing has been reduced to a minimum, and frequently has been entirely eliminated.

PHYSIOLOGIC OR FUNCTIONAL BASING

A second group agrees in emphasizing the relative immobility of teeth in an apical direction, but denies the necessity of stress-breakers and insists that a combination and equalization of bone and tooth support can be accomplished by some form of physiologic basing. This group favors a few relatively mobile direct retainers, to be used for only limited retention. Functional displacement of the mucosa must be secured by using pressure in making the impressions or by means of a "pressure rebase" which will record the functional form of the tissues as contrasted with the static anatomic form (Fig. 2).

Requirements for physiologically based appliances are listed as follows: (1) the tissue side of bases must present functional form, (2) artificial teeth must make slightly premature contact, (3) occlusal rests or attachments must be just unseated until the mucosa is displaced to functional form, (4) direct retainers must be freely movable and (5) direct retainers must be kept to a minimum and used for retention only.

The advantages which should accrue from this type of appliance are:

1. Simplicity of design and construction results in light weight, small bulk and little servicing.
2. Lightness of clasp contact, or freely movable frictional attachments, is kind to the abutment teeth.
3. Mucosa and ridge really bear their part of masticatory burden.
4. Tissues are physiologically stimulated or massaged resulting in normal function and repair.
5. Necessity for rebasing is eliminated because of cell proliferation caused by physiologic massage.

The disadvantages which may result from this type of appliance are:

1. The denture is not well stabilized because of the free-moving and minimum number of direct retainers. The soft tissues must resist lateral thrusts.
2. The denture is uncomfortable at first because of high occlusal contacts.
3. The over-compression of tissue necessary to secure functional displacement

5. Neurohr, F. G. Health conservation of the periodontal tissues by a method of functional partial denture design. J.A.D.A. 31:59 (Jan.) 1944.

6. van Minden, F. Ideal stressbreaking for partial dentures. J.A.D.A. 30:657 (May) 1943.

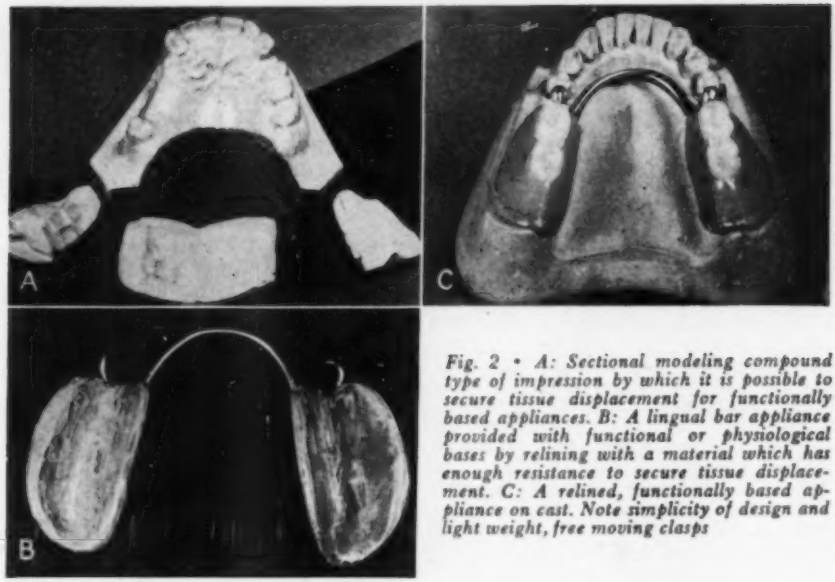

Fig. 2 • A: Sectional modeling compound type of impression by which it is possible to secure tissue displacement for functionally based appliances. B: A lingual bar appliance provided with functional or physiological bases by relining with a material which has enough resistance to secure tissue displacement. C: A relined, functionally based appliance on cast. Note simplicity of design and light weight, free moving clasps

will result in rapid resorption of the mucosa and the need for rebasing in many instances.

4. Movement of the restoration results in a sense of insecurity.

5. Indirect retention is inefficient because of the vertical movement of the denture.

6. Remaining teeth do not perform their share of stabilizing and supporting stress.

In support of the principle of physiologic basing, Applegate[7] writes:

> An appliance . . . should be able to move with the tissue which supports it. . . . A clasp should provide only sufficient retention to resist dislodgment by the adhesion of foods . . . peripheral muscular action . . . or gravity. . . . An impression material is required which will effect partial displacement in the softer areas. . . . When stress is applied, the fluid content of the subjacent tissues will be slightly displaced. After the load is released, a slight tissue rebound occurs. Increase in blood flow results. . . . This physiologic stimulation maintains a healthy condition and counteracts resorptive processes.

Donovan[8] says,

> Rebasing lower dentures is usually advisable either by the impression method or after the denture has been completed. . . . It is a good plan to arrange the clasp lug so that when the denture is inserted, there is a slight distance free. . . . The saddles, of course, in all these cases, must do the major portion of the work.

Girardot[9] states,

> The saddles, to be most comfortable, should conform to the functional shape of the tissues, rather than the anatomic shape. This is assured by the special wax rebasing technic.

7. Applegate, O. C. Stresses induced by a partial denture upon its supporting structures and practical methods for their control. Proceedings of the Dental Centenary Celebration 1940, p. 308-318.

8. Donovan, E. H. Suggested fundamental principles for partial denture design. Apollonian 11:22 (Jan.) 1936.

9. Girardot, R. L. History and development of partial denture design. J.A.D.A. 28:1399 (Sept.) 1941.

. . . Occlude under pressure, which produces a functional impression.

Jordan[10] says,

An accurate copy of the teeth is essential in all cases, but the soft tissues that may be utilized for any portion of the denture foundation should be recorded in a state of functional displacement. . . . If compression of the mucosa is not accomplished during impression making, rebasing should be done either during the procedure or after the denture is made.

McNeil[11] adds, "In most instances, tissue borne cases should be taken under pressure."

The Pasadena Prosthetic Study Club[12] reports,

There should be a minimum number of clasps on a case for retention, and a minimum of contact area on the tooth. There should be sufficient grasp to retain the denture, but also sufficient resiliency to allow the denture to move on compressible tissues and permit of a certain amount of independent movement of the saddle.

BROAD STRESS DISTRIBUTION

A third group believes that excessive trauma to both ridges and teeth can be prevented by stress distribution over as many teeth as it may be advisable to engage with rests and rest-supported clasps. In this way, stresses are reduced on any one tooth or ridge, as all collectively bear the load. Four teeth carrying a load may be physiologically stimulated to robust health, while two teeth carrying the same load may be overworked and traumatized, and become loose. Both of the previously mentioned groups engage as few teeth as possible with direct retainers for retention only. The same groups attach little significance or importance to the horizontal shifts of a denture. However the lateral movements are strongly emphasized as destructive by the third group members, who recommend multiple tooth engagement by clasps and extra rests chiefly to prevent these movements. Why require two teeth to carry all of a given burden when four or more may be utilized? Various designs of appliances utilizing the principle of broad stress distribution are shown in Figure 3.

Requirements for distributed stress restorations are listed as follows: (1) cast or rigid wrought internal or external direct retainers, (2) positive lug seats, (3) all rigid, nonflexible framework, (4) multiple rests and direct retainers, as many as feasible, (5) indirect retainers to add stability, where practicable and (6) well adapted, broad coverage bases.

The advantages of this type of design are:

1. Functional stresses are limited and distributed, protective influence is exerted and overstimulation is prevented.
2. Teeth are immobilized, allowing for tissue regeneration.
3. The teeth and base area aid each other by bearing their proportionate share of the stress.
4. The dentures function efficiently for a long time without loss of teeth or rebasing, since no stress supporting element is overstimulated or traumatized.
5. Little servicing is necessary because the rigid construction eliminates hinge and movable devices.
6. Restorations are well stabilized against teeth to resist lateral thrusts.
7. Restorations permit, and usually provide, excellent indirect retention.
8. The ridge tissues are sufficiently stimulated to promote health, but trauma is avoided because of the assistance furnished by the remaining teeth.

Disadvantages which may result from this type of design:

10. Jordan, L. G. Partial dentures. J.A.D.A. 29:169 (Feb.) 1942.
11. McNeil, W. I. Partial dentures. Fort. Rev. Chicago D. Soc. 8:7 (Nov.) 1944.
12. Pasadena Prosthetic Study Club. A study in partial denture construction. J.A.D.A. 20:598 (April) 1933.

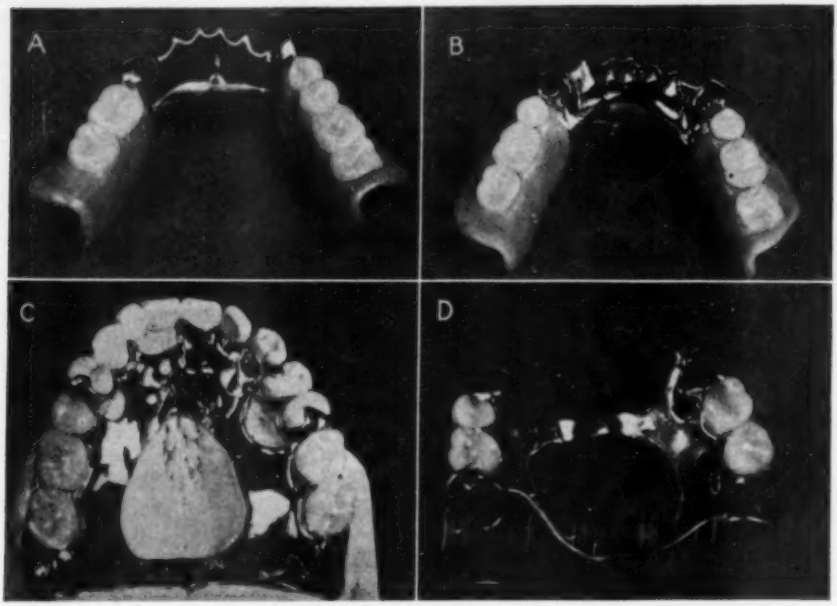

Fig. 3 • A: Simple lingual bar partial denture utilizing all remaining teeth for stabilization and stress distribution. B: Appliance providing greatest possible distribution of stresses by combining continuous clasp as integral part of lingual bar. C: Upper partial denture utilizing all remaining teeth and all possible bony tissue to equalize stresses. D: Palatal bar appliance, well stabilized by three clasps, broad tissue coverage, and two rigid bars. An additional positive rest embraces gold inlay of left first bicuspid to further distribute masticatory stresses

1. Additional supports and contacts on teeth sometimes irritate the tongue.

2. Because of multiple contacts, the appliance may be more conducive to caries.

In support of stress distribution, Addison[13] has this to say,

> We know that the more teeth included in the construction of the restoration, either with multiple attachments or with multiple united abutment pieces, the better the division of the stresses among the remaining teeth.

For stability DeVan[14] states,

> Other teeth [besides abutments] in the arch should be utilized through occlusal rests in the lingual embrasures. Such teeth could be designated as auxiliary abutments.

Elliott[15] adds much to the thinking of this school by saying,

> . . . the majority of partial dentures can be planned in a simple manner and still render as satisfactory service as many of the more complex designs requiring the use of precision type retainers and stress-breakers. To be able to design partial dentures so that all the complex stresses that are induced during function of the partial denture and its supporting structures

13. Addison, P. I. Application of the mucostatic principle to the precision attachment partial denture. D. Survey 22:108 (Jan.) 1946.

14. DeVan, M. M. Embrasure saddle clasp—its principle and design. J.A.D.A. 22:1352 (Aug.) 1935.

15. Elliott, F. C. A method that simplifies the design of partial dentures. J.A.D.A. 27:1263 (Aug.) 1940.

could be equalized, and to keep these stresses within physiological limits of each case, would be ideal.

Levin[16] lends his support with,

Profound thought must be given to minimizing occlusal and lateral stresses and to the broadest possible distribution of these stresses.

Schott[17] writes,

The devotees of stress breakers on partial restorations . . . argue for the massaging effect. . . . It seems to me merely a transfer of trauma. . . . I have seen few [stress-broken cases] that will last a great length of time without remaking or readjusting to prevent abnormal pull and stress on the attachment teeth as the case settles.

Schuyler[18] insists,

Our problem as denture prosthetists is the reduction and distribution of stress in an effort to prevent overstimulation and destruction of the tissues supporting our appliance. . . . Unnecessary saddle mobility endangers the supporting tissues. . . . Therefore we must, whenever possible, limit and distribute functional stresses, thereby endeavoring to keep stimulation within the bounds of tissue tolerance. . . .

Stressbreakers are seldom indicated, and never those which permit all the occlusal stress to be placed on the saddle supporting tissue, or which permit excessive movement of the denture base. . . . The most nearly permanent results are secured by a distribution of force, and such distribution is impossible with connectors of this type.

Smith[19] says,

Contact against remaining teeth is the chief means of stabilization in tooth-borne cases and of considerable importance in tissue-borne cases.

Steffel[20] upholds the school by saying,

The denture must have definite tooth support by multiple clasps and occlusal rests. The greater the number of rests, the better the stress distribution.

Woodworth[21] sums up his views by stating,

[This design] . . . distributes the masticatory stress over as many natural teeth as desired, thereby taking the stress off of or relieving the abutment teeth.

In summarizing, let it be emphasized that a partial denture, properly designed and meticulously constructed, dignifies the partially edentulous arch. One that is poorly designed wrecks it. Therefore, a further discussion of the relative merits of the three types of treatment for the partially edentulous arch, and a full, clear elaboration of just when and where to best apply the design of each school of thought can well constitute sufficient material for additional extensive research. Despite the fact that there are numerous superb materials and technics for the fabrication of partial dentures, and many different possible designs for a given case, nothing can supersede good judgment, coupled with a knowledge of basic principles. Many dentists use snap judgment in the application of these fundamental principles; or even worse, they send restorations to a remotely located dental laboratory which makes up a "run of the mine" appliance based solely on mechanics. The results are devastating to the teeth, soft tissue, and osseous structures.

In evaluating the opposing views herewith presented, remember that minds are like parachutes, they function well only when open. Therefore it is not a compromise with evil, nor is it the shunning of a moral responsibility to patients, to say that advocates of the three types of partial denture design—those favoring stress-breakers, those who advocate physiologic basing, and those who support extensive stress distribution—have much in

16. Levin, M. D. Physiologic tooth and tissue stimulation. D. Survey 22:59 (Jan.) 1946.

17. Schott, C. H. One piece cast removable appliances. J.A.D.A. 15:1299 (July) 1928.

18. Schuyler, C. H. Stress distribution as the prime requisite to the success of a partial denture. J.A.D.A. 20:2149 (Dec.) 1933.

19. Smith, G. P. Cast clasps: their uses, advantages, and disadvantages. Am. J. Orthodont. & Oral Surg. (Oral Surg. Sect.) 33:479 (June) 1947.

20. Steffel, V. L. Simplified clasp partial dentures designed for maximum function. J.A.D.A. 32:1093 (Sept.) 1945.

21. Woodworth, J. G. The engineering and construction of partial dentures. D. Mag. & Oral Topics 48:1030 (Nov.) 1931.

their favor, when the particular design is given the correct clinical application. The dental laboratory technician does not possess sufficient data to do this. The design must be decided on by painstaking diagnosis. Only the dentist, who studies the case with the aid of roentgenograms and study casts, and with the patient present, can arrive at the correct solution. The dentist must consider the characteristics of the tissues along with the mechanics and in that way measure the problem.

Not until then should he proceed with the mechanical and structural phase of the restoration. In a general way, it may be stated that a partial denture should be constructed as simply as possible, consistent with function. Pendleton[22] has stated conclusively, "Materials and methods avail but little when the structural characteristics of the tissues are ignored." He further states that, "The biologic factors . . . are the directing influences or controls that determine the virtue of the procedures employed in clinical practice."

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22. Pendleton, E. C. Influence of biologic factors in retention of artificial dentures. J.A.D.A. 23:1233 (July) 1936.

General dental service in a hospital

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Every hospital should have a dental service just as it has its surgical service, medical service, orthopedic service, eye, ear, nose and throat service and other allied services.

Certainly a competent oral surgeon and dental diagnostician should be available to every hospital. One of them should be qualified to carry out the routine dental requirements as well as the allied services for patients which are commonly supplied in service hospitals. Anyone who expects to work in a hospital should be trained in routine hospital procedures. The diagnostician should be able to design and direct the construction of splints. He should know how to construct lead screens where radium is used in the treatment of oral malignancies, and he should be able to prepare radium holders for the mouth in connection with the treatment of oral and throat malignancies. He should supervise the construction of special adjunctive appliances required in connection with rhinoplastic scaffolding and other special types of prosthetic replacements including acrylic eyes.

The dental laboratory service of some Government hospitals has constructed acrylic tubes for deep vaginal roentgen ray treatment, special tracheal tubes and

Presented before the Section on Hospital Dental Service, ninetieth annual session of the American Dental Association, San Francisco, October 20, 1949.

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numerous other types of appliances. Many hospitals other than Government service hospitals are equipped with the same type of dental service. The dental department of the Mayo Clinic is a good example.

Office practice and hospital practice are two entirely different types of dentistry. The patient whose physical condition is such that confinement to a hospital is a requirement for treatment has an entirely different outlook on life. Not every dentist is qualified to step into hospital practice or conduct the operation of a dental service in a hospital. The dentist who aspires to practice in a hospital should have considerable training over and above that of the average dentist in general practice. He should have served an internship in a good hospital and, if possible, have had a residency in his specialty. These prerequisites are not absolutely essential but they are helpful. Many dentists now practicing in hospitals without having had the advantage of an internship or residency have attained their present positions and obtained their knowledge the hard way. To have had hospital training is a great help as it smoothes out many rough places and prevents the individual from having many embarrassing moments. It gives the operator a confidence that can be gained in no other way.

To handle a hospital dental practice successfully the dentist should have a working knowledge of the administration of the hospital or at least know the fundamental principles of hospital administration routine. He should be familiar with admittance procedures, ward requirements, diet management and discharge procedures. He should have a clear understanding of his limitations as prescribed by law and the rules and regulations of his particular hospital.

Each intern and officer assigned to hospital duty in the Government service is given a good working knowledge of ward procedure and administration, the writing of histories and progress reports, admission and discharge procedures, keeping of registers and numerous other details required in the handling of hospital dental patients as well as patients requiring other professional services. Dental officers are instructed not to overstep their professional boundaries in administering treatment, not to tread on the toes of officers in other services and to insist on like courtesies from other services. Dental officers are instructed in all phases of operating room and general hospital technic so that they may have confidence in their own ability and inspire confidence in others.

Many of the services performed by dentists in the hospital are associated with the services of the eye, ear, nose and throat surgeon and the general surgeon. It is becoming difficult to draw a hard and fast line as to where the services of the oral surgeon with a dental degree end, and the services of the eye, ear, nose and throat surgeon with the medical degree begins. Many times the fields of treatment overlap so far that to draw a line would be difficult. In many instances the two specialists work together.

Teaching hospitals in the armed services provide a one year dental internship for the recent graduate which, it is felt, is second to none. These hospitals, designated as teaching hospitals, meet all the requirements of the Council on Dental Education of the American Dental Association and each hospital holds a certificate issued by that Council.

The teaching staffs include not only selected officers of the Army Dental Corps, rated in the specialty to which they are assigned, but civilian consultants thoroughly versed in their specialties. Most of the civilian consultants are men well known to the profession and in most instances they are teachers with many years of experience.

The dental service of the Armed Forces hospitals is divided, for operating and teaching purposes, into four main di-

visions: operative, prosthetic, oral surgery and periodontics. All phases of dentistry are grouped under one of these four sections and the intern teaching program is drawn accordingly.

The dental service in a Government hospital must take its share of the general load of extra curricular activities as required of the other services. In the armed services there are duties connected with examining boards, courts, training for students and innumerable other activities. Instruction in these extra activities is given to the interns and reserve officers when they are on active duty. A general outline of this type of work is given to ROTC students while on summer training. The over-all administration and operation of the hospital should be taught to all interns for in no other way can they appreciate the numerous details required in the handling of a large institution such as a city, state, county or private hospital.

The respect and confidence accorded a dentist by physicians and the administrative personnel of a hospital are in direct proportion to his demonstrated knowledge of operative procedures and his understanding of the limitations and possibilities of the institution in which he serves. Many dentists go into a hospital expecting everything to be done for them. Up to a certain stage this is right and proper but there are certain things which the dentist must do for himself or have sufficient knowledge to give concise, clear instructions. He must conduct himself so that he gains the good will and the confidence of those with whom he must work, in order to obtain their cooperation. He must demonstrate by actual performance that he is entitled to professional respect. He must be able to perform, not just talk, a good operation or a good service. He must know and follow explicitly good operating room technic in every phase and procedure. He must be able to demonstrate to the skilled general surgeons and others of the medical sciences that he is as well versed and trained to operate in his specialized field as they are in theirs. In most cases the dentist, just as any other member of the staff, will be accepted as a full staff member of the hospital service if he demonstrates to all concerned that he is entitled to full recognition as a staff member.

There is a real need for more well planned dental intern programs which can train operators for hospital dental service. The Government hospitals provide one of the best one year internships in the country, with clinical material second to none. The Army has eight general hospitals that are now conducting an intern course. The teaching schedule is prescribed by the Surgeon General of the Department of the Army. A brief outline of the schedule is as follows:

The training period is for one year. The professional staff consists of (1) an assigned dental staff, consisting of officers of the Armed Forces dental services, (2) an attending dental staff, consisting of civilian members of the dental profession who are diplomates or acceptable to the various dental specialty boards.

The program is directed by the commanding general of each general hospital and is supervised by the chief of dental service and the hospital dental education committee.

The hospital dental education committee consists of (1) a chief of dental service, (2) chiefs of each section of the dental service, (3) one or more representatives of the civilian dental attending staff.

Detailed records and reports are made on each intern. Each intern spends an equal amount of time in each section on a rotating basis. He has available all required reference and teaching aids, standard medical and dental books, periodicals, motion pictures, slides, film strips, projectors, models and other aids. He is given a refresher course in the basic sciences. The intern must attend weekly conferences and clinics. These include

clinical pathology conferences, tumor clinics, staff conferences, sectional conferences and literature reviews. He is instructed in anesthesiology and surgical technics. Applied practical application periods of all subjects cover a greater part of the time. Although the requirement of practical operative procedures for each intern is high, it is usually exceeded by each intern during the intern year.

The Army Medical Center in Washington, D.C., conducts a postgraduate course of four months in oral surgery, prosthetics, orthodontics, periodontics and allied subjects. The Navy and United States Public Health Service have similar programs. The Armed Forces provide graduate training in specialties in civilian institutions with all tuition paid by the Government. In addition each officer in the Army Dental Corps attends the Medical Field Service School and receives professional postgraduate training at the Army Research and Graduate School, Army Medical Center, Washington, D.C. The program is designed to provide officers who are qualified to take their places in hospital dental service in or out of the government services, and to provide adequately trained men as chiefs of services both in the government and civilian hospitals. This same type of training should be provided by civilian postgraduate courses and dental schools should try to fit their graduates to take their place in the hospital dental services. Many overconfident young men who feel that they are ready for hospital dental service meet with early embarrassment if not defeat because of lack of training. The dentist in general practice who occasionally goes into the hospital to practice often finds himself at a loss because he is unacquainted with hospital procedures.

I wish it were possible for every dentist to serve for a period of time in some type of hospital dental service. Both he and his patients would be benefited thereby.

It is in the hospital and its outpatient department that the future oral specialist has his greatest opportunity to serve. It is in this service that he comes in closest contact with his fellows of the healing art on equal terms. Here he sees a patient in a different light and under different circumstances than in private practice. I hope to see members of the dental profession taking more active interest in hospital practice. But to do this they must prepare themselves to fit into the hospital team.

Ways and means must be devised to see that the dental profession is not passed by in any scheme that may be set up in the near future. Dentists may not like some of the things that may be in the offing, but if they convince others that they are fully capable of providing more than routine dental service dentistry will have a point in its favor. Unless the dental profession is on guard, dentistry may be overlooked or left out in the changes that may come about in the not too distant future.

Dentistry, mobilization and manpower

Leo J. Schoeny, D.D.S., New Orleans

Intent upon remaining at peace, the United States as a matter of national policy has determined that, under current world conditions, one effective way of achieving that purpose is to remain strong through defense preparations. As Dr. Howard A. Rusk pointed out at the recent meeting of the Annual Congress on Medical Education and Licensure in Chicago, "In the mobilization of our material, human, spiritual and financial resources to meet the present emergency, it is readily apparent that the major factor in our success will be dependent upon manpower."[1]

It is also readily apparent that today the democracies of the West have far less sheer manpower available to them than do those nations who are potential enemies. This, however, gives us no great alarm for certainly our experience in the last war clearly demonstrates that our industrial power, when fully mobilized, can more than offset this advantage in mere numbers of men. If, however, we are to make full use of our advantage in science, engineering and mass production methods, it is essential that our nation have sufficient skilled manpower to realize our full industrial potential. It is also equally important that this manpower be healthy in order that it can make its full contribution.

We today are primarily concerned with the problems of dentistry as they are affected by mobilization, but as dental health is an integral part of general health, I should like to review the three primary aspects of health manpower which have been the concern of the Health Resources Advisory Committee of the National Security Resources Board of which I have been a member since last August.

The first of these will be a review of the steps that have been taken by our Committee and those other agencies of the Federal government which are concerned with health manpower and the effects of the withdrawal of dentists and other health personnel for military service upon our civilian health economy.

The second is to give the thinking of our Committee on the problem of insuring a sufficient flow of students into preprofessional and later professional training to meet both the military and the civilian health needs of our nation.

The third is to present our Committee's analysis of the over-all national needs for dental manpower during this period of national emergency.

At the suggestion of the President, the Health Resources Advisory Committee to

Presented before the meeting of the Board of Trustees of the American Dental Association, March 19, 1951, Chicago.

Member, Health Resources Advisory Committee to the National Security Resources Board, which also serves as the National Advisory Committee to Selective Service.

1. Rusk, Howard A. Medicine, mobilization and manpower, presented at the Annual Congress on Medical Education and Licensure in Chicago, Ill., Feb. 12, 1951.

the National Security Resources Board was formed on August 5, 1950.[2] Dr. Howard A. Rusk was appointed chairman and the other members are Dr. Harold Diehl, Dr. Alan Gregg, Mrs. Ruth Kuehn, Dr. John B. Pastore, Dr. James C. Sargent, Dr. William P. Shepard and myself. The Committee was charged with the the responsibility of advising the chairman of the National Security Resources Board on problems in the entire field of health resources and through him the President and the various Federal agencies and departments on the health problems of mobilization. Its functions were to include policy recommendations relating to: (1) mobilization, allocation and utilization of personnel necessary for wartime health services; (2) environmental sanitation services; (3) veterinary medical services; (4) utilization of health facilities; (5) provision of health equipment and supplies; and (6) maintenance of essential teaching and research in health fields. The Committee and the Health Resources Office are not operating agencies but function to aid in formulating policies to guide other governmental and nongovernmental agencies and organizations.[3]

On October 4, the President by Executive Order designated the chairman and the members of the Health Resources Advisory Committee to be chairman and members of the National Advisory Committee to Selective Service on the Selection of Physicians, Dentists and Allied Specialists.[4] This Committee was established by Public Law 779 providing for the registration and drafting of physicians, dentists, veterinarians and allied specialist categories. This law stipulated that the President should establish a National Advisory Committee to advise the Selective Service System and "to coordinate the work of such State and local volunteer advisory committees as may be established to cooperate with the National Advisory Committee."[5, 6]

Two days later, on October 6, a state advisory committee was appointed by the National Committee in each state.[7] The nucleus of each of these state committees consisted of a physician chairman, a dentist and the state health officer. Each of these state committees had the authority to appoint additional members and to establish such subcommittees or regional committees as they desired. In January, 1951, a two-day meeting attended by all of the nuclear committee members was held in Washington for the purpose of clarifying and interpreting the philosophy and policies for which they are responsible.[8]

Thus the Health Resources Advisory Committee serves also as the National Advisory Committee to Selective Service. This dual function is logical as the consideration of health manpower resources and the drafting of health manpower for military service are inextricably bound together.

On December 22, 1950, the Department of Defense established a very significant policy which represents an important advance in our efforts to coordinate planning in health manpower as it relates to both military and civilian needs. This policy in effect makes the Health Resources Advisory Committee responsible for reviewing the over-all quotas of the Department of Defense for physicians,

2. Memorandum of the President to the heads of executive departments and agencies, Aug. 30, 1950.

3. National Security Resources Board press release, Aug. 5, 1950.

4. Executive Order establishing the National Advisory Committee on the Selection of Doctors, Dentists and Allied Specialists, Oct. 4, 1950.

5. Public Law 779, 81st Cong. 2d Sess., an amendment to the 1948 Selective Service Act, approved Sept. 9, 1950.

6. Selective Service System memoranda and bulletins: Local Board Bulletin No. 7, Students of healing arts, Feb. 2, 1951; Operations Bulletin No. 10, Reopening the cases of special registrants, Oct. 26, 1950.

7. National Advisory Committee to the Selective Service System: Information Bulletin Vol. I, No. 1, Nov. 17, 1950; No. 2, Nov. 28, 1950; No. 3, Jan. 19, 1951; No. 4, Jan. 31, 1951; No. 5, Feb. 1, 1951; No. 6, Feb. 2, 1951.

8. Unpublished proceedings of the National Meeting of State Advisory Members to the Selective Service System, January 1951.

dentists and veterinarians after each of the three military services has established its projected requirements. They are reviewed by the Armed Forces Medical Policy Council and the Health Resources Advisory Committee whose recommendations are then sent to the Secretary of Defense for final decision.

In addition to the above procedure, after April 1, except for the members of Organized Reserve Units, the names of all Reserve medical and dental officers being recalled for active duty by the three military services will be submitted to the state advisory committees of the National Advisory Committee to Selective Service prior to the issuance of orders.

The state advisory committee can then determine the essentiality of the individual Reserve officer to the health and welfare of his own community and either declare the individual available for military service or ask that his call-up to active duty be delayed because of essentiality. When a state committee declares a Reserve officer as essential, but his specific training and experience are urgently needed by one of the military services, the service may appeal and the final decision as to call-up will rest with the Secretary of Defense. It is anticipated that this will occur very rarely.

Other activities of our Committee in recent months have been:[9]

1. A review of the estimates of current and projected needs of each of the following major Government agencies: U. S. Public Health Service, Veterans Administration, Civil Defense, and Department of Defense.

2. A study of estimates of minimum needs of health personnel to maintain essential civilian health services during a national emergency.

3. The development of informational data on the effect of Public Law 779 on hospital residency programs and on medical, dental, veterinary and public health teaching programs.

4. Consideration of the problems of the classification and recruiting of nurses and of their utilization in a national emergency.

5. Review of the manuscript on "Civil Defense Health Services and Special Weapons Defense" prepared by the Health Resources Office for Civil Defense Office of the Resources Board.[10]

6. Consideration of problems in the health education fields.

7. Consideration of problems in military, veteran and civilian hospitalization.[11]

8. Consideration of problems in rehabilitation, especially as they pertain to industrial mobilization.

It is on the basis of the data obtained in these studies that I shall present the thinking of our Committee on the problem of insuring a sufficient flow of students into preprofessional and later professional training to meet both the military and the civilian health needs of our nation.

As the Scientific Manpower Advisory Committee of the National Security Resources Board headed by Dr. Charles Allen Thomas has pointed out, scientific manpower is essential to our security.[12]

Legislation now before Congress proposes that all physically fit youths reaching the age of 18 be given a period of four months basic training.[13] Upon completion of this training they shall be liable for military service not to exceed 27

9. Report of the Health Resources Advisory Committee to the Chairman of the National Security Resources Board on the activities of the Committee, August 5-December 31, 1950.

10. United States Civil Defense Health Services and Special Weapons Defense, Federal Civil Defense Administration, Dec. 1950.

11. Report to the President from the Committee on Veterans' Medical Services, Howard A. Rusk, M.D., Rear Admiral Robert L. Dennison, U.S.N., and Arthur S. Abramson, M.D., September 22, 1950.

12 The Scientific Manpower Advisory Committee of the National Security Resources Board. Plans for the development and use of scientific manpower, Jan. 12, 1951.

13. S 1, 82nd Cong. 1st Sess.

months including basic training. Those who have not graduated from high school would be deferred until graduation or age 19.

The period of service would begin immediately for all except a limited number who would elect, qualify and then be placed on inactive duty for the Reserve Officer Training Corps and the Reserve Specialists Training Corps. The R.O.T.C. would provide for a continuous supply of trained officers for military service from all fields of education.

It is proposed that the Reserve Specialist Training Corps would consist of 75,000 men selected annually for three years to provide a continuous flow of men to be trained in science, engineering, medicine, dentistry and other critical fields essential to national strength. It is anticipated that after three years there would be a sufficient flow back into the colleges of men who had completed their 27 months of service to meet future needs.

Candidates for the R.S.T.C. would be selected by a board of educators with both civilian and military representation, on the basis of competitive examination adjusted by other indications of aptitude or attainment. It has been estimated that in addition to the 75,000 men entering the R.S.T.C., there would be from 55,000 to 75,000 men entering the R.O.T.C. for other fields of advanced education. The above two groups plus returning veterans, women students and persons physically disqualified for military services should be sufficient to meet the nation's need for future health and other scientific manpower.

As the four months' basic training and the time required for testing, screening and releasing trainees under the R.S.T.C. program could involve an interruption of a year or two of the flow of students through college, the Thomas committee has recommended that in addition to the R.O.T.C. candidates some 75,000 men with superior aptitude for college work in science, engineering and preprofessional health fields be deferred to enter college in September. They also recommend that a similar number now in their freshman year be deferred and that the military service of all students entering the junior and senior classes in September be postponed until their graduation in 1952 and 1953, provided they continue in good standing in their college programs.

In endorsing the proposals of the Thomas committee, our Health Resources Advisory Committee has estimated that the minimum number of graduates required annually to provide for the present civilian supply and the military requirements of the health professions is 19,350 in all categories.[14] Allowing for a 20 per cent attrition rate during college due to drop-outs and failures and a 10 per cent attrition rate during the professional school years, the Committee estimates that to have 19,350 graduates each year in the health fields, it would be necessary to have 25,000 students start their preprofessional training annually.

The number of dentists completely or partly retired or not in practice is not known. Studies of physicians, however, indicate that the total number of inactive physicians approximates a number equal to two thirds of those 65 years of age or older.[15] For lack of better information, this same estimate has been made for dentists, which indicates that there are now 80,000 dentists actively engaged in their profession.[16, 17]

This brings me to the third factor—our Committee's analysis of the over-all national needs for dental and other health manpower during this period of national emergency.

14. Testimony of the Health Resources Advisory Committee before the Senate Preparedness Subcommittee on S 1.

15. Dickinson, Frank G. Age distribution of physicians in the United States, 1940 and 1948. J.A.M.A. 139:51 (Jan. 1) 1949.

16. 1950 American Dental Association Directory.

17. Moen, B. Duane, and FitzGerald, Leslie M. Nineteen fifty survey of the dental profession. I. Introduction. J.A.D.A. 41:253 (Aug.) 1950.

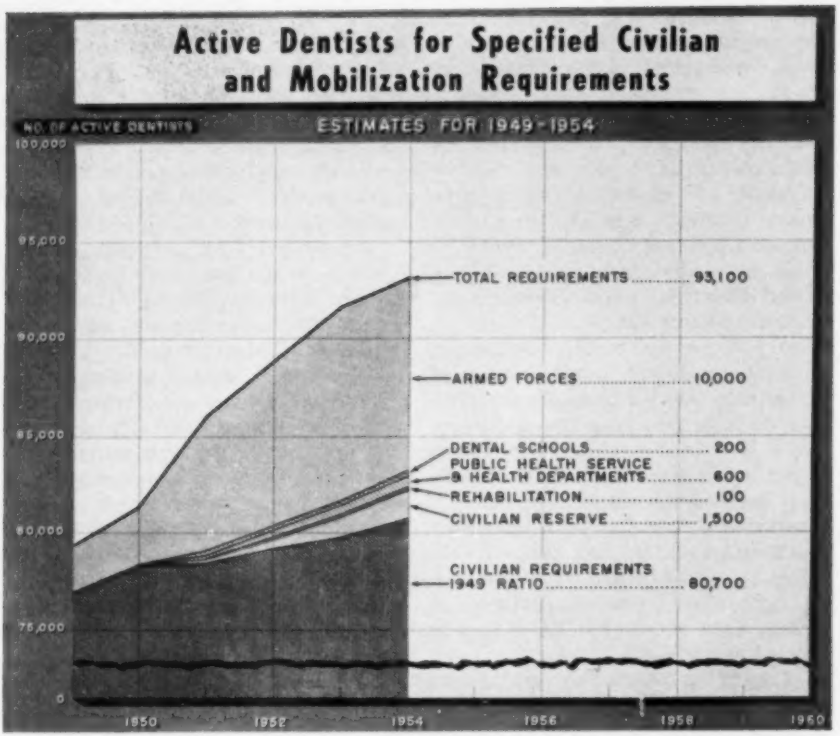

Figure 1

Looking ahead, we must assume that, for the next 10 years or more, we may be in a state of partial or complete mobilization with an armed force of unprecedented size for peacetime and all of the added burdens of our economy that are an inevitable sequelae of such an effort.

For purposes of planning, therefore, our Committee has made three basic assumptions as to our health needs that seem logical. First, we should maintain our 1949 dentist-population ratio and service. This basic assumption infers that the 1949 ratio of dentists to population was minimal. Second, we should meet the additional requirements of civil defense, of industry, of public health services, of rehabilitation services, and of staffing dental schools. Third, we must meet the needs of the Armed Forces.

The bottom arrow of Figure 1 indicates the number of dentists that will be required from 1949 through 1954 to maintain the 1949 civilian standards, based on the ratio of the number of active civilian dentists to population in the year 1949.[16]

The second arrow shows the projected additional needs for dentists for purposes of civil defense reserve as estimated from confidential data; 200 in 1951, increasing to a total of 1,500 in 1954. Remember that in civil disasters dentists will be expected to render emergency type of serv-

ices along with physicians. Disaster may also wipe out many dentists due to their concentration in large cities.

The third arrow shows the projected needs for dentists in the expanding industrial mobilization and for industrial dental requirements and rehabilitation necessary for industrial expansion as the result of the industrial utilization of increased numbers of women, physically handicapped and aged workers.

The fourth arrow shows the projected needs for dentists based on full staffing of local health departments and the added load thrown upon the public health services in the expanding war economy; 200 in 1951, increasing to a total of 600 in 1954.

The fifth arrow shows the projected additional needs for dentists to man present vacancies in the essential teaching in our dental schools; a total of 200, which does not take into consideration the needs for research and expansion.

The sixth arrow shows the projected additional needs for dentists required for the Armed Forces beginning with 2,400 as of 1949, increasing to 7,000 for the authorized 3,500,000 troop strength in 1951, and increasing further to 10,000 in 1954 on the assumption of a possible troop strength of 5,000,000 by that date. It should be pointed out that this is an assumption only, for there is no way to forecast accurately what the actual size of the Armed Forces may be by that date. Last summer, shortly after the outbreak in Korea, Congress voted unanimously to suspend manpower ceilings on the Armed Forces for a period of four years. The most recently announced goal of the Department of Defense has been a goal of 3,462,000 men. Secretary Marshall has stated, however, that this goal "is not a ceiling—it is a minimum of strength in the present situation."

On Wednesday, March 7, the United States Senate voted a statutory limitation of 4,000,000 troop strength on the size of the Armed Forces. Whether this ceiling of 4,000,000 is adopted will be dependent upon the action of the House of Representatives, and undoubtedly on changing world conditions. To allow for a minimum margin of safety for planning purposes, our Committee has based its studies on a possible armed force of 5,000,000 by 1954.

Since each of these categories has been superimposed in turn over the base line of those dentists estimated as being needed at the present rate of net gain over the years 1949 to 1954, a substantial deficiency becomes apparent (Fig. 2). In Figure 2 this total need has been compared with the supply of active dentists which can be expected in 1954 at the present level of training, 2,900 graduates a year.

As near as it is possible to estimate, 9,200 dentists over and above those now in sight for the year 1954 will be required to maintain the present level of civilian dental services, to meet the special needs of industrial mobilization, to meet the minimum needs of an adequate civil defense program, and to meet the projected needs of the Armed Forces based upon a ratio of 2 per 1,000 troop strength.

It is at once apparent that a substantial deficiency in dental manpower is already upon us and this deficiency is steadily increasing. It will not be possible to avoid or even reduce this deficiency before 1954. Whatever the demand, the present supply of dentists must meet all needs until then, or as soon thereafter as the training of additional dentists not now in process of education can be completed.

If any one of the listed categories is to receive a complement equal to that indicated in these projected figures it can be only at the cost of a decrease below present levels of those dentists committed to other categories. It must be made clear, therefore, that in presenting these figures of projected needs there is no attempt to indicate that it is presently possible to meet these projected figures in any category. For example, the pro-

jected figures of the Armed Forces indicating need of some 2 dental officers per 1,000 troop strength in 1951 to 1960 does not indicate that we feel that such a ratio is a permanent minimum necessity or that there are sufficient dentists available to supply these needs without serious disruption of other essential categories. Obviously the problems of utilization in the Armed Forces should be a matter of continuing study.

This deficiency implies a serious threat to the health and welfare of the people. It is the duty and privilege of American dentists to meet this threat to the civilian and military population. The answer as to how is the responsibility of the dental schools and the dental profession rather than of our Committee.

In our deliberations, however, there are at least two avenues of approach suggested.

The first of these is a straight increase in the enrollment in dental schools as shown in Figure 3. Some of this increase might come through the opening of new schools. As can be seen in Figure 3, even a 15 per cent increase over 1949 beginning next September would produce no increase in graduates for four years. By the summer of 1960 we should, by increasing the enrollment by 15 per cent, have produced but 2,400 of the needed 10,700.

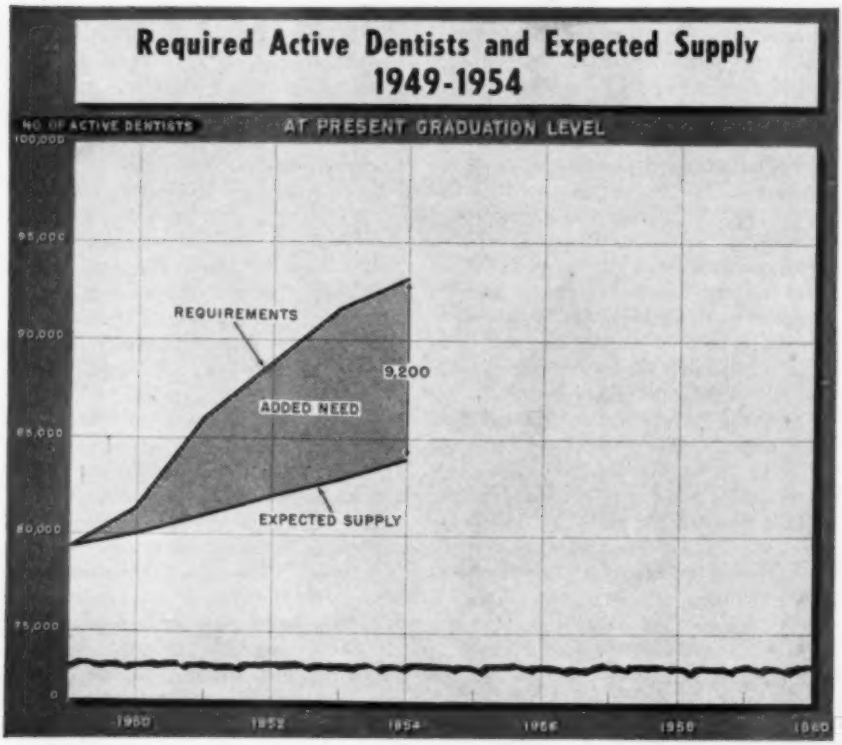

Figure 2

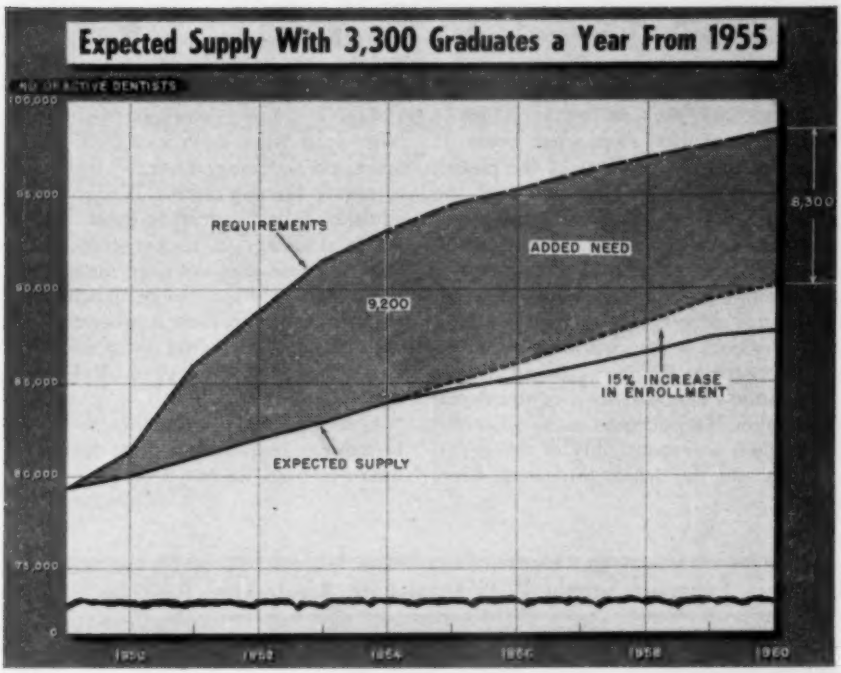

Figure 3

The other possibility that has been suggested to our Committe is acceleration. We have used the term "acceleration" here although it is really a misnomer, for in acceleration we are not really speeding up the educational process but in reality are conducting an uninterrupted educational process of the same duration by eliminating summer vacations.

Acceleration might take any one of several forms. It can be accomplished by eliminating the traditional summer vacations and enrolling a new class every 9 months, completing 36 months of training within three calendar years. This would permit the graduation of an extra class in three calendar years.

For the purposes of this study, our Committee has based its conclusions on the above plan, the effects of which are shown in Figure 4. This method of acceleration would produce an additional 2,900 dentists within three calendar years. This would amount to 5,800 dentists by 1960. This is a net increase more than twice as great as that which would be produced by enrollment increases alone. Acceleration would also start producing results at least two years earlier than could be obtained by enrollment increases alone.

All of us recognize the difficulties of an accelerated program. We should, however, be able to profit somewhat by our experience with acceleration in the last war. For example, we now have established mechanisms whereby the depletion of teachers in our dental schools

can be prevented. Students need not be disturbed by change in their student status.

I would like to reemphasize that this is not a recommendation, but a picture of the results of these steps when taken. It is not within the province of the Health Resources Advisory Committee of the National Security Resources Board, or of me as their spokesman, to recommend the steps that should be taken by our schools of dentistry to meet this need for additional dentists. Our Committee is an advisory body to the chairman of the National Security Resources Board, not to the nation's dental schools or the dental profession. The decision as to what can be done is a responsibility of the dental schools and the dental profession. From our studies and experience, however, it seems to us that the only way this need can be met is through some form of acceleration or expansion or both.

The remaining shortage is still too large even when both increased enrollment and acceleration are put into effect to reduce the gap seen in Figure 5. The additional 9,000 dentists produced by acceleration and a 15 per cent enrollment increase does not close the gap entirely. Belts will have to be tightened all around even with such a program. Perhaps the question should be considered as to whether it is necessary to fill the total deficiency.

Obviously and inescapably there will be a grave shortage of dentists during the next five years for the needs of a mobil-

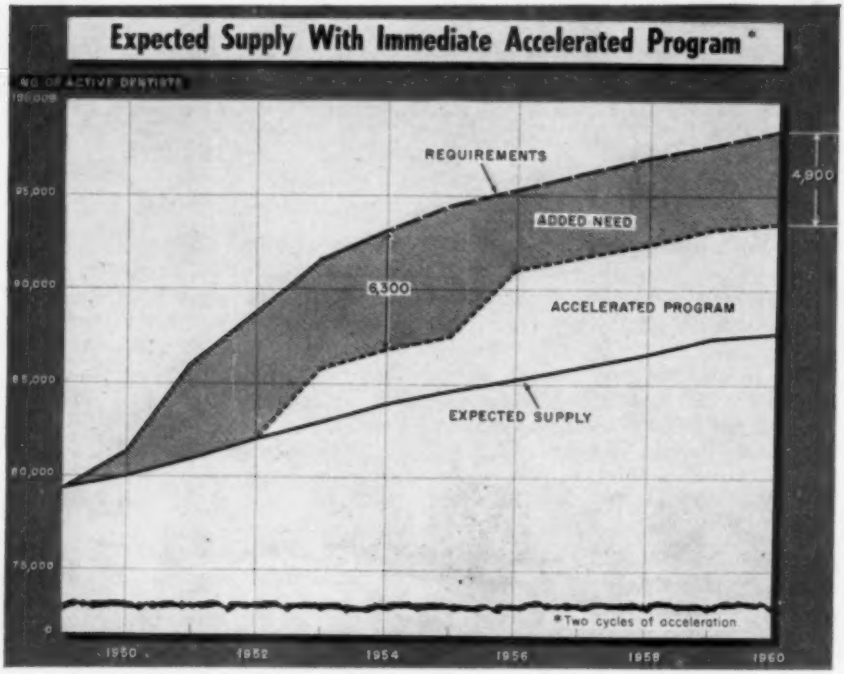

Figure 4

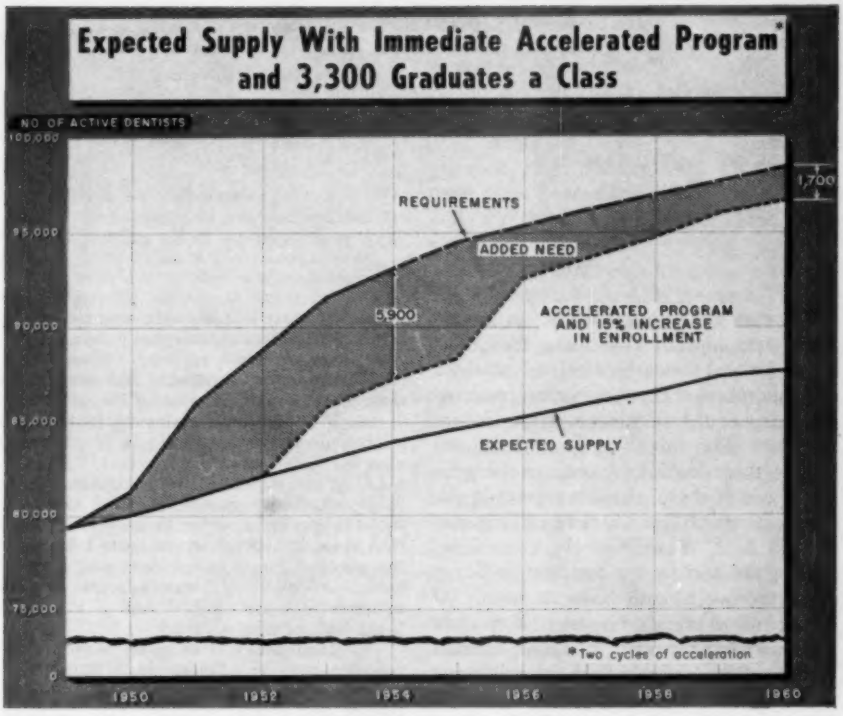

Figure 5

ized economy. At the present rate of training, the supply of dentists by 1954 would be short by 9,200.

Today, in the interests of national safety, our sons are being called into military service, industry is retooling itself for defense, the life of every man, woman and child in the nation is being altered from the normal patterns of peacetime. In the face of this, we in dentistry must do our share. We, too, must gear our thinking and our plans to the realistic situation which the nation faces.

The possible plans which I have outlined do not impose an oversupply of dentists upon the nation. In the event that the international situation becomes more favorable, the increased tempo of training could be readily adjusted. The estimates are conservative. They are not excessively demanding.

During the last war, our profession was faced with a grave emergency. In the even more serious problems we face today, we fortunately have the experience of that situation to guide us. I am confident that we shall not fail.

Maison Blanche Building

COUNCIL ON DENTAL RESEARCH

Vita-filling

Soon after the appearance of an advertising pamphlet for Vita-filling, the Council on Dental Research received inquiries from members of the Association concerning many of the statements in the advertisement. The following quotation from one of these inquiries expresses the general tenor of the profession regarding advertisements of direct resinous filling materials. ". . . This [that is, Vita-filling] looks good and we are tempted to buy it even tho we already have a supply of several other brands. However, if you can give us what we need to know, even if not complete, it would help either in using a better material or warning us not to buy still another package. . . ." Therefore, the Council on Dental Research decided to have an investigation made.

As a first step, the Council sent the following letter, dated November 21, 1950, to the makers of Vita-filling:

Gentlemen:

The Council on Dental Research of the American Dental Association have received copies of your advertising brochure, "Introducing to the dental profession . . . An important new dental product," in which certain claims are made for your Vita-filling. Some members of the American Dental Association have requested the Council's advice regarding some of the statements made by you regarding "Vita-filling," hence this letter of inquiry.

(1) You state in the brochure that "After two years of testing in the mouths of hundreds of control cases—we proudly present to the dental profession . . . Vita-filling." Please furnish the Council on Dental Research the names and addresses of the investigators who tested Vita-filling ". . . in the mouths of hundreds of control cases— . . ."

(2) You state, "Absolutely no pulp irritation (proven safe histologically on control cases large or small cavities)." Please give the name of the histologist who conducted these investigations, the name of the institution in which the histological investigations were conducted and a copy of the histologist's report.

(3) Your statement that Vita-filling has, "Unique adhesive quality . . ." and "actually forms integral structure with the tooth" infers that there is a bond between the tooth and the plastic filling. Do you have any data to show that Vita-filling "Actually forms integral structure with the tooth"? And if not what is the basis of such a claim?

(4) Inference is also made in your advertising that Vita-filling, since it is a copolymer of acrylic resins, has "less dimensional change and greater stability" than ordinary filling materials. What data are supporting this inference?

I have informed the members of the American Dental Asociation who inquired about the claims in your advertisement that I have written you this letter. Both the Council and the members would appreciate a prompt reply.

Secretary
Council on Dental Research

As no reply was received, a second letter, dated December 8, 1950, was forwarded to the Vitaliner Company:

Gentlemen:

Under date of November 21 I sent you a letter of inquiry relating to an advertisement of your Vita-filling material. As I have not had a reply to my letter of November 21 I am enclosing a copy and am sending this by

Foreword by the Council on Dental Research to the technical report of the American Dental Association Research Fellowship at the National Bureau of Standards.

registered mail with a return receipt requested. I anticipate a prompt acknowledgement.

Secretary
Council on Dental Research

The company's reply of December 12, 1950, is herewith reproduced.

Gentlemen:

Thank you for your letter.

Until the necessary data is accumulated by us we will delete all of the paragraphs mentioned by you in all of our advertisements.

The last of our circulars was mailed several weeks ago and if you should receive any queries regarding the product from dentists—these dentists have received the circular a few weeks ago. We have the receipt from the post office of our last mailing.

If we decide again to advertise in 1951, the circular will be completely changed and the statements or paragraphs in your letter will be completely removed until you give us permission to use those statements, and that use of course will depend upon the facts and evidence we present to you.

We want you to know that we will cooperate completely with the council and any suggestions will be appreciated.

Joseph Ashton, Pres.
The Vitaliner Co.

From this correspondence it will be seen that either The Vitaliner Company does not have the data to support their statements or the company is not willing to furnish the data.

The Council could not evaluate the claims from the information furnished by the company and could not, therefore, inform the dentists who wished to know if Vita-filling is superior to similar types of the direct resinous filling materials.

As a second step in the investigation, the Council, with the permission of the National Bureau of Standards, requested the American Dental Association Research Fellowship at the National Bureau of Standards to investigate Vita-filling, especially as pertains to the claims presented in their advertising pamphlet. These claims are as follows:

"After two years of testing in the mouths of hundreds of control cases—we proudly present to the dental profession . . ."

"Vita-filling is composed of co-polymer acrylics, a definite improvement over ordinary filling materials"

"Vita-filling has the following superior qualities:

1. Absolutely no pulp irritation (proven safe histologically on control cases large or small cavities).

2. Produces no excessive heat. No cavity liner required.

3. Cures harder than ordinary acrylic filling materials (tensile strength 11,000 lbs. per sq. inch. Ordinary acrylics, 9,000 lbs. per sq. inch).

4. Cures in 3 minutes in mouth, yet operator has ample working time, about 2 minutes at normal room temperature.

5. Extreme glossy smoothness. No grit or porosity. All authorities agree co-polymer resins have less dimensional change and greater stability.

6. Absolutely resistant to food stains, strong liquids, medicines, blood, etc.

7. Not affected by acid conditions resulting from food decomposition in mouth.

8. Unique adhesive quality of co-polymer acrylic resin combinations in Vita-filling aids greatly in adaptation to cavity walls. Actually forms integral structure with tooth. No loosening or washing out.

9. Can easily be mixed on slab or dappen dish. Polishes to a most beautiful lustrous translucency.

10. 13 pre-mixed shades comparable to the latest New-Hue Shades."

The Fellowship's report, which follows, shows:

1. Lot or batch number. No lot or batch number was present on the packages or containers. It would appear that for adequate production control, certainly, a batch or lot number on the package or containers should be a routine procedure.

2. Powder-liquid ratio. The mixing directions are not clear and will cause some confusion among dentists using the material. The powder and liquid, when proportioned with the measuring devices accompanying the package, are not in

the same ratio as that determined by following the method outlined in the instructions for use.

3. Temperature rise. The temperature rise during polymerization (claim no. 2) was next to the lowest of any material tested and should not be the cause of irritating the pulp.

4. Time of curing. The material is the slowest setting of all investigated. Consequently, the matrix strip should be held unremittingly taut for from 8 to 10 minutes after the filling is placed. To hold it for four minutes, as recommended in the mixing instructions,[1] is not good practice.

5. Hardness. The claim that Vita-filling cures harder than ordinary acrylic filling materials is not borne out by the investigation as shown in Table 2.

6. Vita-filling, in common with other direct resinous filling materials, is porous.

7. The inference is drawn that as "Vita-filling is composed of co-polymer acrylics, a definite improvement over ordinary filling materials" and as stated in claim no. 5, ". . . all authorities agree co-polymer resins have less dimensional change and greater stability," then Vita-filling has less shrinkage during polymerization than other direct resinous filling materials. The data in the report show that Vita-filling has no unusually low shrinkage during polymerization.

8. Solubility. Other assertions in the advertisement (claims no. 6 and 7) that Vita-filling is "Absolutely resistant to food stains, strong liquids, medicines, blood, etc." and is "Not affected by acid conditions resulting from food decomposition in the mouth," give the impression that Vita-filling is unique in these aspects of solubility because it is a co-polymer acrylic. Such is not the case since solvents which attack methyl methacrylate resin attack Vita-filling. It has no unusual resistance.

9. Adhesiveness. The advertisement for Vita-filling (claim no. 8) states: "Unique adhesive quality of co-polymer acrylic resin combinations in Vita-filling aids greatly in adaptation to cavity walls. Actually forms integral structure with tooth. No loosening or washing out." Also in the instructions[1] for using which accompanied the kit containing the Vita-filling, it was stated, "Vita-filling is not just a modified self-curing acrylic. It is so chemically formulated and adjusted that the adhesive qualities alone are remarkable. You will note that Vita-filling adheres so tenaciously to cavity walls that it is almost impossible to remove the set Vita-filling. This is a very important quality of the co-polymers—adhesiveness, thus making it ideally suited in direct restorations." These two assertions definitely convey the idea that Vita-filling forms an integral bond with the hard tooth tissues and that Vita-filling is unique, that is, without a like or equal in this respect in comparison with other direct resinous filling materials. Simple tests given in the report show that these statements have no basis in fact.

10. "Reground filling material." In the advertising pamphlet, the dentist is told to "remember" that ". . . Reground filling material has no permanency, develops porosity, pulls away from the cavity, and is not suitable for acrylic filling material. . . ." Both the laboratory and the clinical testing by the American Dental Association Research Fellowship at the National Bureau of Standards do not disclose any such behavior of reground resinous filling material.

11. It does therefore appear that the claims heretofore discussed which the manufacturer makes for Vita-filling are usually extravagant and misleading.

12. No evidence was uncovered in the investigation by the Fellowship that would indicate that Vita-filling is an unsafe or unsatisfactory material.

Council on Dental Research

1. Instructions for use of Vita-filling which accompanied the kit. Chicago, The Vitaliner Co., 1950.

Direct resinous filling materials: an investigation of Vita-filling

George C. Paffenbarger, D.D.S.; Robert B. Wolcott,† D.D.S., and Denton L. Smith,* Chem. Eng., Metal. Eng., Washington, D. C.*

Three kits of Vita-filling were obtained from a retail dental depot on November 29, 1950. No batch or lot numbers were located on either the kit or the individual bottles.

DETERMINATION OF POWDER-LIQUID RATIO

Before any physical tests were conducted on Vita-filling, the proportional amounts of powder and liquid to be used in the mixes were determined following the directions which accompanied the packages. The unit proportioners (for the powder and for the liquid) which are part of the kit were first employed as directed on page 7 of the instructions[1] for use. One unit of powder as determined by the powder measure weighed approximately 1 Gm.; one unit of liquid measured approximately 0.6 ml. This ratio of 1 Gm. of powder to 0.6 ml. of liquid made a mix that was unnecessarily thin. In the mixing directions[1] that accompanied the package, one was advised to:

"1. Measure a unit of powder.

2. Add Liquid drop by drop until powder surface is thoroughly wet and a glossy surface is noted."

Mixes made according to these directions contained 1 Gm. of powder to 0.5 ml. of liquid. This resulted in a mix of better consistency.

Throughout the subsequent investigation, a half unit mix of 0.5 Gm. of powder was combined with 0.25 ml. of liquid in preference to the manufacturer's recommendation of using one unit which makes a mix that is unnecessarily large.

TEMPERATURE RISE DURING POLYMERIZATION

The temperature rise during polymerization was determined by the method followed in another investigation.[2] The average peak temperature for Vita-filling in a cylinder 200 mm.[3] in volume was 53.5°C. (128.3°F.) (Table 1). This represents a 16.5°C. (29.7°F.) rise above body temperature in the resin. The temperature in the pulp chamber would be much lower. In a former experiment[2] the peak temperature of one resin went as high as 100°C. (212°F.) but the peak temperature in the pulp chamber reached 56.5°C. (133°F.), only 19.5°C. (35.1°F.) above body temperature. In this experiment 2 mm. of dentin separated the pulp from the resin. Therefore, there seems little likelihood that any pulp injury from thermal causes would be due to the peak temperature developed in Vita-filling or in any of the other materials in Table 1. However, no data was discovered in the literature showing how high a temperature the pulp could tolerate for short periods of time without injury.

The opinions or assertions contained in this article are the private ones of the writer and are not to be construed as official or reflecting the views of the Navy Department or the naval service at large.

*Research associate of the American Dental Association at the National Bureau of Standards.

†Commander, DC, USN (Naval Dental School), stationed at the National Bureau of Standards.

1. Instructions for use of Vita-filling which accompanied the kit. Chicago, The Vitaliner Co., 1950.

2. Wolcott, Robert B.; Paffenbarger, George C., and Schoonover, Irl C. Direct resinous filling materials: temperature rise during polymerization. J.A.D.A. 42: 253 (March) 1951.

The average time at which the peak temperature of Vita-filling occurred was 12 minutes, 03 seconds.

In common with all of the resins which are slow to polymerize (Table 1), Vita-filling has a much lower peak temperature than the rapid setting resins.[2] This fact, that Vita-filling is slow setting, must be considered in its clinical use. The peak temperature (an indication of initial hardening) does not occur until about 12 minutes after beginning the mix. Vita-filling, because of its slow setting, is not placed in the mold or cavity until four minutes after beginning the mix. Therefore, there is an eight minute interval between the time that the mix is placed in the cavity and the time of development of the peak temperature. Consequently, the matrix strip should be held in place for not less than eight and preferably 10 minutes before pressure is released and not for the recommended four minutes as given in the instructions for mixing.[1]

HARDNESS

The resistance of a number of direct resinous filling materials to indentation was determined by a method in which a 3 Kg. load was applied on a steel ball a half inch in diameter to obtain secure contact with the specimen for the initial reading. A load of 30 additional kilograms was applied and the depth of the indentation measured at various intervals of time. The specimen was a rectangular strip 38 mm. long, 14 mm. wide, and 1.2 mm. thick, conditioned at mouth temperature for five days in air but tested at room temperature.

The depth of the indentation at the end of 10 minutes for the various brands of direct resin is shown in Table 2. These

Table 1 • Peak temperature and times of occurrence on cylinder having a volume of 200 mm.[3]*

Trade brand	Average† temperature rise above 37° C. (99° F.)		Average† time of peak temperature
Kadon	48 ± 4° C.	86 ± 7° F.	4 min. 50 sec. ± 20 sec.
Replica	37 ± 2° C.	67 ± 4° F.	6 min. ± 07 sec.
Dentafil	26 ± 5° C.	47 ± 9° F.	6 min. 55 sec. ± 15 sec.
Duz-all	21 ± 5° C.	38 ± 9° F.	8 min. 15 sec. ± 15 sec.
Plasto-filling pf3	20 ± 2° C.	36 ± 4° F.	8 min. 15 sec. ± 40 sec.
Fastcrown	18 ± 1° C.	32 ± 2° F.	10 min. 45 sec. ± 16 sec.
A-thermoplast V-10	14 ± 2° C.	25 ± 4° F.	11 min. 30 sec. ± 15 sec.
Vita-filling	16 ± 3° C.	29 ± 5° F.	12 min. 03 sec. ± 10 sec.

*Data for all materials except Vita-filling are from another report.[3]
†Average of five specimens.

data show that Vita-filling has practically the same hardness (measured by resistance to indentation) as several other brands of direct resinous filling materials.

Table 2 • Resistance to indentation of some dental acrylic resins*

Trade brand	Depth of indentation (mm.)
Denture base†	0.096 ± 0.002†
Duz-all	0.097 ± 0.002
Vita-filling	0.101 ± 0.003
Plasto-filling pf3	0.103 ± 0.002
Kadon	0.105 ± 0.002
Replica	0.107 ± 0.002
Fastcrown	0.107 ± 0.002
Dentafil	0.110 ± 0.003
A-thermoplast V-10	0.123 ± 0.005

*Data obtained by W. T. Sweeney and William D. Sheehan in the Dental Research Laboratory, National Bureau of Standards.
†Average of seven current brands.

POROSITY

The porosity was qualitatively determined by dissolving specimens of the polymerized resins in chloroform in a system which would collect the gases present. It was found that Vita-filling, in common with other currently used direct resinous filling materials, contained gas. Specimens of Vita-filling contained 0.08 milliliters of gas per gram of specimen. Gas in other brands of self-curing resins ranged from 0.02 to 0.18 milliliter per gram. The gas bubbles are easily seen when a filling is sectioned. In all cases the technic of mixing as advocated by the respective manufacturers was used. The instructions[1] for mixing Vita-filling call for mixing in a jar, covering the jar for two or three minutes, and then remixing. The remixing procedure introduces into the mix much of the air present. It is therefore recommended that dentists using Vita-filling neglect the remixing. The same holds for all of the other direct resinous filling materials.

DIMENSIONAL CHANGE DURING POLYMERIZATION

An average of five determinations of the volumetric shrinkage of Vita-filling from the time the resin is placed in the cavity until 30 minutes after beginning the mix show it to be 6.25 ± 0.25 per cent. Other resins averaged from almost 6 to over 8 per cent. Vita-filling, therefore, has no unusually low shrinkage during polymerization as compared with similar brands of self-curing resins used as filling materials.

SOLUBILITY

The low solubility of methyl methacrylate resin, when used as a denture base, to substances present in the oral environment, is well established. Solubility tests showed that Vita-filling was not unusually resistant to chloroform or benzene and went into solution or dispersed at about the same rate as an equal amount of methyl methacrylate resin. Some of the direct resinous filling materials which apparently have cross-linkages are much more resistant to solution in chloroform and benzene than is Vita-filling. It would appear that solvents which attack methyl methacrylate resin attack Vita-filling also. A dentist using Vita-filling or any of the other resinous filling materials should protect them from any of the organic solvents which attack methyl methacrylate resin.

ADHESIVENESS

Vita-filling did not adhere to the tooth tissues nor did any of the other direct resinous filling materials.

The most elemental type of testing, such as placing any of the direct resinous filling materials in a saucer-shaped cavity in a tooth and then dislodging the fillings after hardening, shows that there is no appreciable amount of adhesion between the tooth tissues and resins. Vita-filling is no exception. Similarly, all of these resinous filling materials, including Vita-filling, pull away from the cavity at one

location or another as they harden and shrink, as shown by simple cross-sectioning of extracted teeth containing resin fillings. There was no difficulty encountered in removing fillings made of Vita-filling or of any of the other resins.

REGROUND ACRYLIC RESIN FILLING MATERIALS

An examination of the powder of Vita-filling under the microscope gave no evidence that the material had been ground. There is evidence that the polymer of some of the brands has been ground as the remnants of some of the small spheres are present. Both clinical and laboratory tests over a period of almost a year have not revealed that the materials which show evidence of having been ground are any less permanent, develop more porosity, have less adhesion to the cavity walls, or are less suitable as a filling material than the materials which consist of the small globes or spheres.

CONCLUSIONS

Vita-filling, a direct resinous filling material, sold by the Vitaliner Company,[3] has the faults and good qualities of other direct resinous filling materials. Its properties are not unique.

3. The Vitaliner Co., 30 East Washington Street, Chicago.

BUREAU OF ECONOMIC RESEARCH AND STATISTICS

Statistics from the military information questionnaire

Shortly after the outbreak of war in Korea in June 1950, it became apparent that many additional dental officers would be needed to meet the requirements of the expanding Armed Forces. So that constituent societies would be prepared to aid in selecting dentists for military service, a questionnaire was designed for the purpose of gathering information on individual dentists pertinent to availability for military service.

Some valuable statistics have become available from 20 states which circulated the Military Information Questionnaire. In most cases these statistics should be highly reliable, as the median percentage of returns reported by these 20 states was 87 per cent. The brevity of the questionnaire and its relation to national defense are probable reasons for the unusually good response.

There were some states, however, that did not send questionnaires to all licensed dentists in the state, as indicated in Table 1. The constitution of the sample group must be considered in interpreting the statistics for these states. For example, if questionnaires were sent only to dentists believed to be of military age, or only to members of the society, it is obvious that a low percentage of retired dentists is to be expected. Some figures appear to be unreasonable and may be the result of clerical error by the state society.

The over-all percentage of dentists returning the questionnaire who were retired was 2.4 per cent, with a range from 0.4 per cent in one state to 8.1 per cent

Table 1 • Per cent of dentists in 20 states with various qualifications bearing on availability for military service*

State	Per cent of dentists									
	Returning questionnaire	In private practice	Retired	Specialists	With past military service	In Reserves	Commissioned as dentists	With dental or predental training at expense of Armed Forces	Married	With dependents under 18
Ark.	88.9	95.8	1.5	6.8	70.6	34.9	82.8	11.3	92.3	77.7
Conn.	46.2	95.9	1.7	14.4	52.2	38.1	94.8	13.2	91.4	65.5
Fla.	60.3	96.7	0.9	14.6	47.7	53.9	93.4	7.5	94.3	†
Ga.	61.6	98.7	0.6	6.6	41.2	28.8	100.0	8.3	93.8	83.1
Idaho‡	82.9	99.3	0.0	11.2	46.2	27.0	92.1	23.5	98.6	80.0
Iowa	88.4	88.3	5.1	8.0	55.7	23.3	98.7	9.5	93.4	51.9
Maine	88.4	93.9	5.0	7.4	34.6	20.4	84.9	10.6	91.9	†
Minn.	86.1	92.8	1.9	8.4	39.7	21.0	94.0	11.7	93.6	51.8
Miss.††	87.0	89.4	8.1	1.1	57.7	23.7	88.1	16.0	90.5	67.0
Mo.	84.0	89.6	3.4	8.7	50.1	19.2	93.7	8.5	88.6	47.9
Nev.	92.5	93.2	1.4	10.8	45.9	20.3	100.0	16.7	95.9	64.3
N.H.§	95.4	98.1	0.5	4.4	58.9	27.8	92.7	14.8	90.7	56.9
N.C.**	51.7	95.4	0.8	7.3	55.0	23.9	88.7	19.3	90.3	59.9
N. Dak.	84.3	93.7	2.1	1.7	41.8	20.3	89.6	9.7	94.9	58.4
Okla.	87.4	95.3	2.6	5.9	39.9	23.7	93.4	11.5	91.9	†
R.I.	74.5	94.4	0.6	9.4	51.7	24.4	92.0	14.7	83.6	†
S.C.	89.3	91.7	3.8	5.0	51.6	23.5	95.1	15.2	90.0	†
Tex.	97.0	92.8	1.2	12.9	59.6	26.0	90.9	17.7	90.5	54.1
Utah‡	76.0	98.0	0.4	12.0	56.3	24.2	94.7	28.3	94.3	68.8
Wyo.**	100.0	96.8	1.6	2.5	39.2	67.3	82.9	12.2	97.6	64.8
All	78.1	93.0	2.4	9.1	50.7	24.7	92.9	12.8	91.6	56.6

*Adjustments were made in the figures submitted by certain states, when it was obvious that an error had been made.
†Statistics lacking or in a form not usable.
‡Questionnaire sent only to members of state society.
§Questionnaire not sent to dentists known to be too old for service.
**Questionnaire sent only to practicing dentists.
††Questionnaire sent to all dentists except those in two Veterans Administration hospitals.

Table 2 • Distribution of dentists by status (20 states)

Status	Number	Per cent
In private practice	12,984	93.0
Employed by government, institution or company	573	4.1
Other occupation	63	.5
Retired	338	2.4
Total	13,958	100.0

in another.[1] Some retired dentists are no longer licensed, and doubtless many retired dentists are inclined to disregard questionnaires. And, as pointed out, some states excluded older dentists from their mailing lists. Therefore, it is certain that the true percentage of retired dentists is higher than 2.4.

Of the 13,958 dentists answering the question on "present status," 12,984, or 93.0 per cent, were in private practice, 4.1 per cent were employed by government, institution or company, 0.4 per cent were in other occupations, and 2.4 per cent were retired (Table 2).

Specialists comprised 9.1 per cent of all dentists replying to this question. This

Table 4 • Distribution of dentists by branch of past military service (20 states)

Branch of service	In dental corps	Not in dental corps	Total	Per cent
Army	3,170	1,040	4,210	59.0
Navy	1,602	326	1,928	27.0
Air Force	578	187	765	10.7
Coast Guard	22	7	29	.4
USPHS	81	16*	97	1.4
More than one branch	88	18	106	1.5
Total	5,541	1,594	7,135	100.0

*The term "dental corps" is not used in the U.S. Public Health Service. All of these dentists doubtless had service as dentists.

1. Percentages given in this article are based on the total number of replies to the question being considered.

Table 3 • Distribution of specialists by specialty (20 states)

Specialty	Number	Per cent
Oral surgery	373	30.7
Orthodontics	370	30.4
Pedodontics	99	8.2
Periodontics	89	7.3
Prosthodontics	232	19.1
Oral pathology	16	1.3
Other	37	3.0
Total	1,216	100.0

Table 5 • Distribution of dentists in Reserves by branch and by whether or not commissioned as dentists (20 states)

Branch of Service	Commissioned as dentists	Not commissioned as dentists	Total	Per cent
Army	1,217	178	1,395	43.2
Navy	1,329	96	1,425	44.1
Air Force	295	72	367	11.4
Coast Guard	3	1	4	.1
USPHS	38	0	38	1.2
Total	2,882	347	3,229	100.0

Table 6 • Distribution of dentists who received dental or predental training at expense of Armed Forces by type of training and number of months of training (20 states)

	Number of months of training											
	1-3	4-6	7-9	10-12	13-15	16-18	19-21	22-24	25-27	28 & over	Total	Per cent
ASTP	52	165	182	175	432	79	12	12	3	3	1,115	64.5
V-12	31	75	43	62	70	60	31	71	47	68	558	32.2
Other	32	5	0	0	1	0	0	1	1	17	57	3.3
Total	115	245	225	237	503	139	43	84	51	88	1,730	100.0

is slightly higher than percentages reported in other recent surveys. Table 3 shows the per cent classifying themselves in each specialty.

About half (50.7 per cent) of the dentists reported having had military service, with a range from 34.6 per cent in one state to 70.6 per cent in another. Fifty-nine per cent of these dentists had served in the Army, 27.0 per cent in the Navy, 10.7 per cent in the Air Force, and the remainder in the Coast Guard and U.S. Public Health Service (Table 4). It is likely that some dentists who served in the Air Force are included under the Army figures, as the Air Force became a separate branch only recently. Of dentists who had served in the Army and Air

Table 7 • Distribution of dentists in Reserves by branch and by rank (20 states)

Rank	Branch of service						
	Army	Navy	Air Force	Coast Guard	USPHS	Total	Per cent
Enlisted	5	4	1	0	5*	15	0.5
2nd Lt. or Ensign	5	20	9	1	1	36	1.2
1st Lt. or Lt. (j.g.)	97	564	64	1	2	728	23.9
Capt. or Lt.	419	370	104	0	4	897	29.4
Major or Lt. Comdr.	552	362	121	1	1	1,038	34.0
Lt. Col. or Comdr.	156	62	45	0	7	270	8.9
Col. or Capt.	43	8	12	0	1	64	2.1
Gen. or Adm.	1	0	0	0	0	1	0.0
Total	1,278	1,391	356	3	21	3,049	100.0

*Evidently an error on the part of two states submitting statistics.

Force, only three fourths had been in the dental corps, while 83.1 per cent who had served in the Navy had done so as dentists.

Approximately one fourth (24.7 per cent) of the respondents said they were now in the Reserves, and this percentage varied from 19.2 in Missouri to 67.3 in Wyoming. There were more Navy Reservists than Army Reservists, despite the fact that over twice as many dentists had served with the Army as with the Navy. Of Navy Reservists, 93.3 per cent were commissioned *as dentists*, against 87.2 per cent of Army Reservists and 80.4 per cent of Air Force Reservists (Table 5).

Table 6 shows that twice as many dentists had ASTP training as had V-12 training. About one of every eight dentists (12.8 per cent) reported having had dental or predental training at the expense of the Armed Forces. This percentage seems high and, together with the high percentage of dentists in the Reserves, leads to the suspicion that a disproportionately high number of returns was received from dentists who were veterans.

More Army Reservists held the rank of major than any other rank, although lieutenant (junior grade), two grades lower than major, was the most common rank among Navy Reservists (Table 7).

Among all the respondents, 91.6 per cent were married, and this figure varied from 83.6 in Rhode Island to 98.6 in Idaho. The percentage of dentists reporting dependents under 18 years of age varied from 51.8 in Minnesota to 83.1 in Georgia.

B. Duane Moen, Director

COUNCIL ON DENTAL THERAPEUTICS

Council classifies 'Thrombodent' dental cones in group C

The Council on Dental Therapeutics has voted to classify 'Thrombodent' dental cones in Group C until such time as suitable controlled evidence is submitted establishing the clinical value of the product.

'Thrombodent' is a combination of thrombin and tyrothricin. Thrombin, U.S.P. is a material of recognized usefulness for topical application to accelerate the clotting of blood. (See *A.D.R.*, ed. 16, p. 93.) Tyrothricin, U.S.P., is an antibiotic mixture which has found some usefulness in medicine for local application in the treatment of certain infections[1] but its dental uses have not been clearly established.

Two studies[2, 3] were cited in support of the usefulness of 'Thrombodent' in dentistry. The first report represented preliminary data on a small number of cases with no controls. The other more extensive investigation apparently included no control series. An attempt is made to compare the results of the latter study with the results of an earlier investigation. In

1. American Medical Association. New and nonofficial remedies, 1950. Philadelphia, J. B. Lippincott Co., 1950, p. 66.

2. Thoma, Kurt H. A new method of space obliteration after odontectomy, a preliminary report. Am. J. Orthodont. & Oral Surg. 31:198 (April) 1945.

3. Cannon, J. T. An evaluation of thrombin-tyrothricin and selected antibacterial agents in postextraction states. Pennsylvania D. J. 14:291 (June) 1947.

view of the obvious difficulties in the comparison of two series of patients in separate investigations under different clinical conditions, it seems desirable to await further controlled studies.

Another investigation[4] involved 50 patients who were treated with the cones while 50 controls received no special treatment. When a patient required bilateral extractions, the same individual served for both treatment and control observations. The investigation was discontinued because of the unfavorable clinical results with the product.

While the data in support of the use of this item are not sufficient to warrant preferential classification, the data are indicative of the possible usefulness of the product and the Council will review any further evidence as soon as it becomes available.

4. Epstein, Sidney. Tyrothricin and thrombin in exodontia. J.A.D.A. 38:599 (May) 1949.

Council announces classification of additional products

The classification of products by the Council on Dental Therapeutics of the American Dental Association has been described in a previous report (*J.A.D.A.* 40:489, April, 1950). The Council's program now provides for classification of products in Group A, Group B, Group C and Group D. Products are reconsidered periodically and decisions are subject to change at any time that a substantial amount of new evidence becomes available. The files of the Council contain information on many drugs and dental cosmetics, and inquiries are welcome.

GROUP A

Listing of products in Group A means that at the time of their consideration, the items conformed with the provisions of acceptance established by the Council on Dental Therapeutics and adopted by the Board of Trustees of the American Dental Association. Items in this group will be listed in *Accepted Dental Remedies*, and may use the Seal of Acceptance, unless otherwise provided.

GROUP B

Listing of products in Group B means that there is insufficient evidence to justify their present acceptance, but there is reasonable evidence of their usefulness and safety. These products meet the other qualifications and standards established by the Council on Dental Therapeutics and the Bureau of Chemistry. It is the Council's opinion that Group B products may be promoted for special use and study.

GROUP C

Listing of products in Group C means that the evidence is so limited or inconclusive that the products cannot be accurately evaluated. It is the Council's opinion that Group C products require further study by qualified investigators.

The following additional product is classified in Group C:

Thrombin Dental Cones with Tyrothricin (Sharpe & Dohme, Inc.): Each cone is stated to contain thrombin, 0.000622 Gm.; tyrothricin, 0.001 Gm., with excipients. (Trademark: 'Thrombodent') (For report, see page 568.)

GROUP D

Listing of products in Group D means that they are unacceptable because of their demonstrated inability to meet the standards outlined in the provisions for acceptance.

MAY 1951

LON W. MORREY, D.D.S., EDITOR
VOLUME 42 • NUMBER 5
Published by the American Dental Association
222 East Superior Street • Chicago 11, Illinois

THE Journal OF THE AMERICAN DENTAL ASSOCIATION

Editorials

Pedodontics placed on parity with other subjects by Minnesota State Board of Dental Examiners

The relatively recent decision of the Minnesota State Board of Dental Examiners to require candidates to insert a Class II amalgam filling in a deciduous molar represents one of the most heartening advances in dental examining and licensure taken in many years. The fact that a state examining body demands that a candidate demonstrate, even slightly, his proficiency in pedodontics is gratifying to those who have long championed the cause of dentistry for children and augurs well for the future of the profession.

Even though the relationship of pedodontics to preventive dentistry and to the general health of the child is well established, too many dentists endorse the subject in principle, not in fact. Perhaps one of the reasons for this irresponsible attitude may lie in the uninspired type of instruction furnished by some dental schools. Although every dental school in the United States provides a course in dentistry for children, many students are not fired with an enthusiasm for the subject. Some instructors still fail to appreciate fully the value of dental service in terms of prevention and general health. Failing in this respect they fail to instill the concept in the minds of their students.

Despite the efforts of leaders in the profession during the past half century, despite the continued stimulating spade work of the American Society of Dentistry for Children since its inception a quarter of a century ago, despite the growing public appreciation of children's dental service, pedodontics still occupies a relatively unimportant place in the dental school curriculum.

As late as 1940 the requirements for the approval of dental schools adopted by the Council on Dental Education included no provision for teaching pedodontics.

In 1941 the Council voted its approval to include dentistry for children as one of the subjects to be required. By 1942 the average dental school devoted 2.33 per cent of the total educational clock hours to the subject. Although several of the schools have since increased their pedodontic educational requirements, many have not.

Perhaps there is some truth to the statement that dental schools prepare students to pass state board examinations. If that be so, Minnesota has led the way toward breaking the bottleneck in pedodontic education. It is hoped that other dental examining boards will soon follow Minnesota's example.

Facts versus fallacies in the fluoridation of drinking water

Dental societies, public health authorities, and others interested in improving standards of dental health will find the Association's latest booklet, *Fluoridation in the Prevention of Dental Caries,* full of helpful information. Prepared by the Council on Dental Health, it presents the latest findings with respect to fluoride metabolism and toxicity, fluoride effect on lactobacillus counts, and results obtained by communities that have fluoridated their drinking water. In addition, it contains information on the types and costs of fluoride feeders and compounds. How anyone, after reading this booklet, can disregard the potential value of fluoridating communal drinking water is beyond comprehension.

There are, however, some who object violently to the water fluoridating process. Usually their arguments are based on emotion rather than reason. A Springfield, Massachusetts, woman complains that fluoridation affects the taste and smell of the water. A dentist in the same city protests the "bulldozing methods" of the United States Public Health Service in promoting the addition of a deadly metallic poison to the municipal water supply. An Omaha attorney objects to the process because fluoride accumulates in the system and affects the cells in the brain. Inane as these arguments are, they help to retard progress. They are reminiscent of the arguments advanced 75 to 100 years ago against the use of amalgam fillings because of the poisonous properties of mercury. They are remindful of the heated objections to the extension for prevention theory when it was first enunciated by G. V. Black. Time and experience have proved the worth of amalgam fillings and Black's principles of cavity preparation. Time and experience will prove the worth of water fluoridation. Already communities that have artificially fluoridated their drinking water to the extent of 1 ppm report a 30 to 40 per cent average reduction of dental caries among their children. Objectors to the process are invited to produce scientific evidence to discount that fact. Others, more interested in the dental health of children than in voicing unsubstantiated opinions, are invited to read and apply the recommendations found in the Association's latest booklet, *Fluoridation in the Prevention of Dental Caries.*

Dental resources and estimated needs in the national defense program

The Advisory Committee to the National Security Resources Board estimates that the United States will be faced with a shortage of some 9,000 dentists by 1954 if the present plans for military defense are put into full effect. This shortage will be increased to 10,700 by 1960, according to a report presented to the Board of Trustees in March by Leo J. Schoeny, member of the Committee. The report is published elsewhere in this issue of THE JOURNAL.

The Advisory Committee concludes, rightfully, that the present ratio of dentists to population, approximately 1:1,730, must be maintained. On this basis 80,700 civilian dentists will be needed in 1954. In addition, the Committee estimates, 1,500 dentists will be necessary for civilian defense, 100 for industrial rehabilitation, 600 for public health services, 200 to fill faculty vacancies and 10,000 for the Armed Forces—12,420 more than are required for purely civilian needs. If the Committee's estimates are accurate, they pose a serious problem, as dentists cannot be trained in a day and dental schools cannot be built or expanded overnight.

For the past twenty years, which include the low enrollment periods of the depression and the high enrollment periods during and since World War II, the number of graduates entering the profession scarcely compensated for the number lost through death and retirement. How, then, will it be possible for our dental schools, now overcrowded and understaffed, to train 12,420 more dentists than normally during the next three years? Obviously it cannot be done.

Two suggestions are made by the Health Resources Advisory Committee as a means of partly meeting the expanded needs: increased enrollment and acceleration. Neither of these possibilities looks promising. An increased enrollment of 15 per cent, if started immediately, would produce no additional graduates for four years and would produce but 2,400 additional dentists by 1960. By reviving the accelerated program of World War II, with its many inherent disadvantages, an additional 2,900 dentists might be trained every three years, or 5,800 by 1960—still far short of the country's needs as estimated by the Advisory Committee.

Since it is patently impossible for the profession to meet the Committee's estimated requirements it would be well to analyze the estimates themselves.

One of the first facets to be analyzed is the dental manpower requirements of the Armed Forces. At present these requirements are determined on the basis of two dentists per 1,000 men. Whether this is an equitable ratio no one, including experienced military officials, now knows. Perhaps an unbiased study will disclose that, by limiting dental officers' assignments to professional duties, curtailing their service to military dependents and relieving them of administrative responsibilities not connected with their professional calling, the dental manpower requirements of the military services could be reduced without lowering the quality or quantity of service.

The Board of Trustees, acting on a recommendation of the Council on Federal Dental Services, in March initiated steps leading to such a review. Certainly the dental needs of the military must be thoroughly met. So, too, must the dental needs of those on the home front. To accomplish this dual purpose with the limited dental manpower available will require the closest cooperation between Federal authorities and Association leaders.

Washington News Letter

Dental affairs in both the legislative and executive branches of government shape themselves into a large question mark, as of this writing. It is, for example, impossible to anticipate with reasonable accuracy what military demands for dentists will be three months hence or whether Federal funds for fluoridation demonstrations are to be increased, kept at present levels, or abolished.

Government support of dental schools remains anyone's guess. Most efficient means of utilization of dentists in civil defense is another problem in search of a solution, so far as guidance from Washington is concerned. Increased autonomy for the Army's dental department is equally uncertain, likewise possible administrative changes in Veterans Administration that would give dental programming, particularly in research and education, a greater degree of independence within VA's Department of Medicine and Surgery.

AID TO LOCAL PUBLIC HEALTH UNITS

Although the Senate has passed a bill that would permit Federal strengthening of local public health units—a measure strongly supported by American Dental Association—chances of House approval are not regarded as bright. Allen O. Gruebbel appeared before the House Interstate and Foreign Commerce Committee on April 12 and filed a statement expressing stout support of the plan in behalf of the Association. He emphasized that a portion of the funds allocated to the local health units should be earmarked for dental health programs.

"Any program designed to bring better dental health to the public must concentrate on a reduction of the incidence and prevalence of dental disease, particularly among children," the secretary of the Council on Dental Health testified. "The Association envisions that passage of the local public health units bill will enable the states to establish additional facilities to carry out the essential dental public health services which are needed in every community.

"The services include epidemiologic studies of dental diseases, preventive health services such as artificial fluoridation of community drinking water or topical application of fluorides to the teeth of children, bacteriologic and chemical diagnostic services for the dental profession, dental health education programs and control of oral cancer. The use of public funds at the community level for programs such as the above will be far more efficacious and far less costly than other proposals which seek direct treatment programs for already diseased teeth."

Another witness at the Congressional hearing, urging that local health units have reasonable freedom in expending Federal funds, pointed out that the city of Boston might be disqualified for financial aid under the pending House bills because the municipal health department provides dental diagnosis and treatment for indigent school children. The witness, Hugh R. Leavell, representing the American Public Health Association, pointed out that the Senate-passed bill (S 445) is more flexible in this respect and therefore more desirable.

PUBLIC HEALTH

In mid-April, a Senate subcommittee on U.S. Public Health Service appropriations began examining into Federal activities in aid to dental education and research, fluoridation and maintenance of the National Institute of Dental Research. Several weeks previously, testimony had been presented to a House subcommittee by Dr. Bruce D. Forsyth, Assistant Surgeon General in general charge of Public Health Service dental functions.

Dr. Forsyth's comprehensive presentation covered such points as the following:

More than 50 per cent of the proposed $1,750,000 budget for the fiscal year beginning July 1 is earmarked for technical assistance to the states ($943,650). Other major items are: research operations, $337,750; research grants to dental schools and other institutions, $221,000; research fellowships, $50,000; coordination and development of dental resources, $125,000.

In 1950, approximately 200,000 children received topical fluoride applications from 39 government teams working in 215 communities of the nation and to date more than 450 localities have established continuing topical fluoride programs.

At the request of appropriations subcommittee members, Dr. Forsyth supplied a list of states in which the fluoridation demonstrations

have been conducted. It includes all states and territories with exception of California, Idaho, Iowa, Minnesota, New Jersey, New Mexico, North Carolina, Ohio, Oregon, Texas, Utah and Wisconsin.

RATIO OF DENTISTS TO TROOP STRENGTH

Charts that have been prepared by Department of Defense, depicting ratios of dental officers to troop strength in Army, Navy and Air Force, disclose that the armed services are finding they can get along satisfactorily with fewer than 2 per 1,000, the ratio of many years standing.

As of the end of February 1951, the combined Armed Forces had 1.6 dentists per 1,000 strength. The Navy proportion was 1.9, Army 1.6 and Air Force 1.5. An interesting observation is that all through the war years (1941-45), the Navy had proportionately fewer dentists than the Army but ever since then its ratio has been higher, reaching a peak of 3 per 1,000 in June 1947.

Incidentally, dentists who are Army reservists may be called upon in the near future to take physical examinations for the purpose of determining their fitness for active duty. State advisory committees to Selective Service will advise on the carrying out of this program.

VETERANS ADMINISTRATION

Full-time medical and dental personnel of Veterans Administration expressed anxiety at reports in April that they were to be militarized in a drastic step to prevent further losses to the Armed Forces and higher-salaried non-Federal positions. Their concern stemmed not only from a pending Congressional bill directed to that end but also from fear that the step was favored by Administrator Carl R. Gray, Jr. The latter, however, disowned any intention to "freeze" dentists and physicians in their jobs.

It is regarded as likely, however, that pending amendments to the draft laws—including revision of the so-called doctor-draft act (Public Law 779)—will include provisions by which VA professional personnel over a certain age, perhaps 30 to 35 years, would be exempt from calls to military duty. Also, it is quite probable that the White House will issue an executive order along these lines even before Congressional action is completed on the new draft law.

SPECIAL JUNE ISSUE

Next month's special issue of THE JOURNAL will be devoted to a critical evaluation of theories concerning the effect of dental foci of infection on health, based on a review of the literature. This exhaustive study, conducted by Kenneth A. Easlick and colleagues at the University of Michigan, was prepared under the general direction of the Council on Dental Health of the Association. In addition to presenting carefully documented evidence concerning all phases of the subject, it presents the latest information on the impact of ACTH and cortisone on dental research.

In announcing the issue the editor expresses the hope that its contents will not only aid members to a better evaluation of existing reports on focal infection, but also serve as a guide in the evaluation of current and coming reports on hormones, newer antibiotics and other agents employed in the treatment of dental and systemic disorders.

Association Affairs

Midwinter meeting of the board of trustees

The Board of Trustees of the Association held its annual midwinter meeting March 19-20 in the Central Office with full attendance of officers and trustees and with Leo J. Schoeny and Paul Barton, dental member and executive secretary respectively of the Health Resources Advisory Committee of the National Security Resources Board, as guests.

Officers and trustees in attendance were: Harold W. Oppice, president; LeRoy M. Ennis, president-elect; Edward R. White, first vice-president; Alfred W. Chandler, second vice-president; M. F. Jarrell, third vice-president; Percy T. Phillips, speaker of the House of Delegates; Harold Hillenbrand, secretary; C. Willard Camalier, assistant secretary in charge of the Washington office; H. B. Washburn, treasurer; W. Earle Craig, Third District; L. H. Jacob, Eighth District; James E. John, Fifth District; Daniel F. Lynch, Fourth District; Obed H. Moen, Ninth District; J. B. Carr, Seventh District; C. S. Foster, Tenth District; Charles I. Taggart, First District; Robert P. Thomas, Sixth District; William McGill Burns, Second District; R. C. Dalgleish, Thirteenth District; Willard Ogle, Twelfth District; Fred S. Shandley, Eleventh District; L. M. Cruttenden, assistant secretary; Lon W. Morrey, editor; and J. J. Hollister, business manager.

DENTAL MANPOWER

Early in the meeting, Dr. Schoeny presented the views of the NSRB on the problem of maintaining dental manpower at a strength adequate for the needs of the nation. The text of his presentation appears on page 548 of this issue.

Armed Services • The Board resolved to recommend that the House of Delegates "reconsider the endorsement of the ratio of two dentists for every 1,000 of military personnel in the light of existing needs and problems," and that the Association "request the Armed Forces Medical Policy Council to develop methods for utilizing dental officers to permit the armed services to meet their dental requirements with a minimum of dental manpower."

The Board further instructed the Secretary of the Association to advise the Armed Forces Medical Policy Council that the Association strongly recommends that "every person inducted into the armed services be given a complete dental examination which would include full-mouth, intra-oral and bitewing roentgenograms and that the results of such examination be recorded and preserved as a part of the inductee's permanent health record." In making the resolution, the Board took note of the serious problem in the practical and economic operation of the Veterans Administration dental program caused by inadequate dental examinations at pre-induction, induction and separation centers.

In another action, the Board approved a recommendation of the Council on Federal Dental Services that "the mission of dental officers in the armed services be limited to maintaining and improving the efficiency of military personnel and . . . that this mission not be handicapped

by the assignment of additional responsibility in caring for the dental health of military dependents."

A recommendation of the Council on Federal Dental Services that the Association seek the establishment of rank and pay equivalent to the grade of major general for the position of chief of dental service in all uniformed services of the Federal Government was also approved.

Dental Schools • The Board approved a recommendation of the Council on Dental Education that the Federal Government be urged to adopt "liberal policies of deferment from military service for essential teachers in the complete dental education program which includes the teaching of both the basic sciences and the clinical subjects," and that the Association "promote the adoption of Federal policies which will insure the deferment from military service of a sufficient number of persons at the preprofessional, professional and postgraduate school level so as to make available the maximum number of qualified dentists to meet the future needs of the country."

The Council on Legislation was directed "when considering Federal aid to dental students to take all steps to ensure that the safeguards of the House of Delegates are met."

BUREAU OF CHEMISTRY

The Board instructed that an amendment to the Bylaws be prepared, for presentation to the House of Delegates, that would discontinue the Bureau of Chemistry and permit administrative establishment of a Division of Chemistry under the supervision of the Council on Dental Therapeutics, and would also increase the membership of the Council on Dental Therapeutics to nine. The stated purpose of the amendment was to avoid losing the advisory assistance of the Bureau of Chemistry, in view of the action of the House of Delegates last year concerning abolishment of the advisory committees to the Bureaus.

Another amendment which the Board instructed be made for presentation to the House of Delegates is to clarify a section of the Bylaws regarding dues for members entering the Association after July 1 of any year. In the interim the section is being interpreted to mean that members entering the Association for the first time after July 1 of any year shall pay one-half of the current year's dues, it was reported.

FÉDÉRATION DENTAIRE INTERNATIONALE

Harold Hillenbrand, secretary, was assigned by the Board to represent the Association at the 1951 meeting of the Fédération Dentaire Internationale in Brussels, Belgium, June 9-16. The Board also authorized the President of the Association to appoint a representative delegation of not less than ten members to the 1952 International Dental Congress in London, at no expense to the Association.

CHILDREN'S DENTAL HEALTH DAY

For expenses in connection with 1952 National Children's Dental Health Day, the Board approved deferred appropriations of $2,820 to the Bureau of Public Information and $8,000 to the Council on Dental Health.

DENTAL PUBLIC HEALTH

Local Health Services Act of 1951 • The Board approved a recommendation of the Council on Legislation that the Association "approve in principle the broad purposes of the Local Health Services Act of 1951," but resolved that the Association request Congress "to define more specifically the provisions dealing with 'adequate public health services' and 'demonstrations,'" in order to clarify

the specific types of health service local health units will render.

Dental Units in State Health Departments • Approval was given by the Board to the recommendation of the Council on Dental Health that that Council hold a conference of persons who can be helpful in retarding the present tendency toward lowering the administrative status of dental units in state health departments.

ANNUAL SESSIONS

Commercial Exhibits • The Board resolved that in hotels under contract to the Association, facilities for commercial exhibits will not be made available for the week preceding, or during the annual session, except in conjunction with the Association's exhibit.

Scientific Exhibits • Rules governing awards for scientific exhibits at the annual session were revised by the Board on the recommendation of the Council on Scientific Session. Under the revised rules, exhibits are classified in three categories according to sponsorship; and awards, based on originality, informative value, artistic quality, pertinency to dentistry, and attendance of sponsors of exhibits, are made for first, second and third places in each category, with honorable mention given at the discretion of the three judges, whose identity is to be kept confidential.

1951 Annual Session • The Board approved a recommendation of the Council on Scientific Session that arrangements be made for presentation of a television program at the 1951 annual session in Washington, D.C., October 15-18.

Membership of the Committee on Local Arrangements approved by the Board for the 1951 annual session is as follows:

Chairman, David J. Fitzgibbon; vice-chairman, George B. Clendenin; honorary chairmen, C. Willard Camalier, Sterling V. Mead, and J. Ben Robinson; advisory chairman, Daniel F. Lynch.

Committee for Associated Groups • John P. Burke, chairman; J. R. Hogan, vice-chairman; W. R. McLister, C. V. Rault, and J. Garrett Reilly.

Committee on Entertainment • Walter L. Smallwood, chairman; Joseph A. Madden, vice-chairman; William D. Curtis, William E. Eccleston, Charles L. Smith, Grant Kirkham, Ralph Bell, George Blevins, E. J. Copping, and Roscoe Lamb.

Committee on Reception • E. Milburn Colvin, Jr., chairman; James J. Greeves, vice-chairman; C. Willard Camalier, Edmund T. Lane, and Harry S. Sembekos.

Committee for Convention Hall • Manly Michaels, chairman; Paul Hoffman, vice-chairman; Henry D. Adams, Ralph W. Barnhard, George Becker, Norman Bernstein, James W. Brown, Jr., Jesse Caden, J. LeRoy Elliott, Louis J. Faust, William M. Michaels, Thomas R. Monks, Harry W. Williamson, and George R. Cadman.

Committee on Information Service • Edward D. Leifer, chairman; Michael Oristian, vice-chairman; Israel Shulman, vice-chairman; Joseph Conlon, Sidney Greenspan, Archie E. Massimo, Harry S. Galblum, Samuel Leishear, James W. Bernhard, Irving M. Rothstein, Howard Lady, Daniel F. Radice, Raymond Herndon, Louis Dubit, and Herman Bernstein.

Committee on Publicity • Francis J. Fabrizio, chairman; Walter A. Rath, vice-chairman; George S. August, Anthony P. Culotta, Morten Goode, Roald Herwick, Edmund T. Lane, A. A. Shapiro, Mathew J. Sullivan, and Ernest V. Williams.

Committee on Ladies' Entertainment • Mrs. W. Lawrence Smallwood, chairman; Mrs. W. Marion Falls, Mrs. John D. Callander, Mrs. William L. Walters, Mrs. Paul Hoffman, Mrs. Marcus Burton, Mrs. John O'Keefe, and Mrs. C. Willard Camalier. •

SOCIAL SECURITY

The Board adopted a resolution of the Council on Insurance requesting that the Bureau of Public Information be directed to use an early issue of the *Information Bulletin* to explain the Association's position regarding the technical problems, advantages and disadvantages of requesting inclusion of dentists in the Old Age and Survivors Insurance provisions of the Social Security Act.

The Board of Trustees of the Association took time out during its midwinter meeting March 19-21 to pose for the photographer. Standing (l. to r.) are: C. Willard Camalier, assistant secretary in charge of the Washington office; Edward R. White, first vice-president; A. W. Chandler, second vice-president; L. W. Cruttenden, assistant secretary; John J. Hollister, business manager; M. F. Jarrell, third vice-president; Percy T. Phillips, speaker of the House of Delegates; H. B. Washburn, treasurer; Robert P. Thomas, Sixth District trustee; Lon W. Morrey, editor; C. S. Foster, Tenth District trustee; W. Earle Craig, Third District trustee; Charles I. Taggart, First District trustee; R. C. Dalgleish, Thirteenth District trustee; Daniel F. Lynch, Fourth District trustee; Willard Ogle, Twelfth District trustee; and L. H. Jacob, Eighth District trustee.

Seated are: Harold Hillenbrand, secretary; Janne Olson, reporter; Harold W. Oppice, president; LeRoy M. Ennis, president-elect; Obed H. Moen, Ninth District trustee; Fred S. Shandley, Eleventh District trustee; William McGill Burns, Second District trustee; James E. John, Sr., Fifth District trustee; and J. B. Carr, Seventh District trustee.

MISSION TO JAPAN

Date of departure of the mission to Japan has been tentatively set for June by the Supreme Commander for the Allied Powers, and five representatives of the Association were designated for the mission by the Board of Trustees. They are: Harold W. Oppice of Chicago, president; LeRoy M. Ennis of Philadelphia, president-elect; Stanley D. Tylman of Chicago, chairman of the Council on International Relations; R. C. Dalgleish of Salt Lake City, trustee for the Thirteenth District; and George C. Paffenbarger of Washington, D.C., research associate at the National Bureau of Standards. Alternates are Maynard K. Hine of Indianapolis, E. Harold Gale of Albany, N.Y., and Philip E. Adams of Boston.

Purpose of the mission, stated in a March 1950 communication from the Supreme Commander for the Allied Powers, is "to render advice in matters of dental education, particularly the . . . curriculum, to present the American views on dental service in relation to social insurance and . . . on the subject of oral hygiene and preventive dentistry and the more recent advances on the use of dental materials and techniques."

Departure of the mission was originally set for January but was postponed because of the Korean situation.

RELIEF FUND

A new rule of the Council on Relief was adopted by the Board, restoring to a 50-50 basis with the state societies the division of grants disbursed to individual needy dentists and their dependents. The Council explained that the plan in effect during the last three years, in which the state societies paid one-third of each grant and the Association's Relief Fund paid two-thirds, has helped the state societies to build up their relief funds to

a point where they are better able to assume the 50-50 responsibility. The new rule brings the division of disbursements to the same basis as the division of contributions, since the Association Relief Fund returns to the state society one-half of each contribution received from dentists in that state.

JOURNAL OF THE AMERICAN DENTAL ASSOCIATION

The Board approved renewal of the contract for printing THE JOURNAL with the General Printing Company for a five year period beginning January 1952. General Printing has printed THE JOURNAL since 1928.

JOURNAL OF ORAL SURGERY

The Board established a three year term of office for members of the editorial board of the *Journal of Oral Surgery*. In order to establish this program, the following appointments were made, retroactive to January 1, 1951: 1952, Don H. Bellinger of Detroit, H. Newman Brownson of Hollywood, Calif., and G. Thaddeus Gregory of Indianapolis; 1953, James R. Cameron of Philadelphia, L. M. FitzGerald of Dubuque, Iowa, and Lon W. Morrey of Chicago; 1951, Reed O. Dingman of Ann Arbor, Mich., and William E. Durbeck of San Antonio, Texas.

NATIONAL RESEARCH COUNCIL

The Board renamed Paul C. Kitchin of Columbus, Ohio, as the representative of the Association in the Division of Medical Sciences of the National Research Council, to serve for a three year term expiring June 1954.

FLUORIDATION MANUAL MAY BE OBTAINED FROM ASSOCIATION

A manual of information regarding fluoridation of water supplies is available on request from the Central Office. The booklet contains "general information for the guidance of dental, medical and public health officials in recommending fluoridation to city officials," according to the Council on Dental Health which prepared it.

ENNIS TO ATTEND NATIONAL CIVIL DEFENSE CONFERENCE

LeRoy M. Ennis, president-elect of the Association, and four other appointees named by Harold D. Oppice at the request of the Civil Defense Administrator, Millard Caldwell, will attend a Civil Defense Conference in Washington May 7-8.

The appointees are: Daniel F. Lynch, Fourth District trustee; R. H. Friedrich, chairman of the Council on Federal Dental Services; C. Willard Camalier, assistant secretary; and F. J. Garvey, executive secretary of the Special Committee on National Emergency Dental Service.

In calling the conference, Mr. Caldwell said there was a need for "an unprecedented nation-wide effort in public education . . . to teach the need and means for survival in the event of attack," and said he hoped the conference would lay the foundation for a program to overcome "our greatest and most immediate enemy—the apathy of the American people to their own danger."

GONZALES NAMED CONSULTANT TO P. R. HEALTH DEPARTMENT

Jose M. Gonzales of San Juan, delegate of the Colegio de Cirujanos Dentistas de Puerto Rico to the ninety-first annual session of the Association last year, has been appointed consultant to the dental division of the Insular Health Department of Puerto Rico, it is reported.

Dr. Gonzales is a 1942 graduate of St. Louis University School of Dentistry and studied pedodontics at the University of

Michigan. In addition to general practice, his activities have included the associate editorship of *Revista Dental*, the Puerto Rican dental society journal, contributions to dental literature in several countries, and the winning of a contest sponsored by the Puerto Rican dental society for his essay on caries prevention.

MEETING DATE CHANGED FOR COUNCIL ON DENTAL RESEARCH

Date of the meeting of the Council on Dental Research of the Association, to be held at the National Bureau of Standards in Washington, D.C., has been changed to May 12, according to J. L. T. Appleton, chairman of the Council. Original date was May 11.

Dental Societies

STATE SOCIETIES RECEIVE REPORT ON LABORATORY ISSUE

A report of a survey of viewpoints regarding licensure, registration and accreditation of dental technicians, prepared by the American College of Dentists, has been sent to the chairmen of the legislative committees of state dental societies. The material constitutes the report of the committee on prosthetic dental service of the College, prepared from material gathered with the assistance of the Council on Dental Trade and Laboratory Relations of the Association. In addition to the committee's report on the history and present status of the problem, it quotes replies to the question, "Will licensure or registration of technicians be good for the future of dentistry?" from state dental societies, leading dentists, dental schools, and other interested organizations included in the survey.

Reprints of the report, which appeared in the September 1950 issue of the *Journal of the American College of Dentists*, can be obtained on request from Otto W. Brandhorst, 4952 Maryland Avenue, St. Louis.

CALIFORNIA ASSOCIATION ADOPTS POSTPAYMENT PLAN

The California State Dental Association has completed arrangements for a postpayment plan for dental care in cooperation with the Bank of America.

Under the plan, patients whose credit has been approved by the Bank make payments directly to the Bank and pay 6 per cent interest. The dentist receives 95 per cent of his fee as soon as the patient's credit is approved. The Bank deposits the remaining 5 per cent to a reserve account to which it charges uncollectible notes. When the reserve account reaches 25 per cent of the total of all notes outstanding under the plan, the 5 per cent deduction will be reduced accordingly.

The plan is based on the one operated by the Detroit Dental Society. The Los Angeles County Dental Society also is operating a similar plan.

Legislation

ASK CLARIFICATION OF LOCAL PUBLIC HEALTH UNITS BILLS

The Association has endorsed "in principle" three bills (HR 274, HR 913, S 445) to provide aid to local public health units, but asked for amendment to define "adequate public health services" and to make provisions for preventive dentistry. S 445 was passed by the Senate on March 16.

The Association's views were presented in testimony filed with the House Committee on Interstate and Foreign Commerce April 11 by Allen O. Gruebbel and Francis J. Garvey, secretaries of the Councils on Dental Health and Legislation respectively.

DEPARTMENT OF HEALTH WITH CABINET STATUS PROPOSED

A bill to create a department of health with cabinet status was proposed on March 15 by Sen. John L. McClellan (D., Ark). A similar bill (HR 3305) was proposed by Rep. C. E. Hoffman (R., Mich.).

The department, headed by a secretary with three assistant secretaries, would take into it, intact, the U.S. Public Health Service and the Veterans Administration Department of Medicine and Surgery. The secretary would be required to submit to Congress a plan for consolidation of the two agencies into a single health and medical career service, a year after the effective date of the Act.

The bill is similar to the one presented in the 81st Congress on the recommendation of the Hoover Commission, which proposed a "United Medical Administration" but without cabinet status.

KANSAS RULES STATE HEALTH BOARD MUST INCLUDE DENTIST

A dentist must now be included in the membership of the Kansas State Board of Health, according to provisions of a bill passed in April by the Kansas State Legislature.

The new bill, sponsored by the Kansas State Dental Association, specifies that the Board of Health must be composed of five physicians and one person from each of the other five health professions including dentistry. Previously, nine physicians and one nonmedical member, usually a lawyer, had comprised the Board.

EX-SERVICE DENTISTS MAY GET PRIORITY ON FORMER OFFICES

At the instigation of the Council on Legislation of the Association, the bill (HR 3029) to provide priority in renting their previous office space for physicians returning from active military service may be amended by its author to include dentists, according to Francis J. Garvey, Council secretary.

Rep. Brooks Hays (D., Ark.), who presented the bill to the House on March 5, has said he will introduce the amendment when and if the bill is considered in a House committee.

HOUSE COMMITTEE CUTS FSA 1951 DENTAL HEALTH BUDGET

The House Appropriations Committee on April 13 slashed by 15 per cent the Budget Bureau's recommended allotment for dental health activities, before approving the budget of the Federal Security Agency for the coming fiscal year. It is reported that the topical fluoridation demonstration program would bear the brunt of the $250,000 cut.

Cuts in budgets of National Institutes of Health leave less than $300,000 available to non-Federal dental research projects and fellowships.

REQUEST FUNDS FOR DENTAL HEALTH AT BUDGET HEARINGS

The Association will request the Senate Appropriations Committee to provide funds for grants-in-aid to the states to assist state and local governments in the fluoridation of water supplies, at Federal budget hearings now being held in Washington.

It will also seek the appropriation of $1,900,000 authorized for completion of the National Institute of Dental Research building, according to E. Harold Gale, chairman of the Council on Legislation.

R. I. DENTAL TECHNICIAN JAILED FOR ILLEGAL PRACTICE

The first jail sentence in Rhode Island for illegal practice of dentistry was imposed

by the State's Superior Court in March, when Michael Pate of Central Falls was given a three month penalty for violating a deferred sentence given last May. It is reported that Pate, a dental technician, had persistently violated the Dental Practice Act in Pawtucket, but heretofore he had always escaped with fines. His offenses had involved taking impressions for dentures, a skill restricted by law to dentists, the report states.

TWO FEDERAL MEDICAL SCHOOLS ARE PROPOSED

A bill (HR 3511) introduced in Congress by Rep. Augustine B. Kelley (D., Pa.) would establish two Federal medical schools to provide a supply of graduates for the military, Public Health Service, Veterans Administration, and other Federal agencies.

REVISED ARMY DENTAL BILL INTRODUCED IN SENATE

A revised version of the Army Dental Bill sponsored by the Association was introduced on April 11 by Sen. Lester C. Hunt (D. Wyo.). Another of its sponsors, Rep. L. Mendel Rivers (D., S. C.), was reported to be asking for hearings on the same bill in the House.

The bill provides for improved dental care for Army personnel by giving the dental chief more control over dental affairs including the assignment and distribution of dental personnel and auxiliary personnel (dental technicians).

Armed Forces

DEFERMENT OF DENTAL AND PREDENTAL STUDENTS NOW PRESCRIBED BY EXECUTIVE ORDER: MAY DRAFT CALL DELAYED

The present policy of deferment for dental and predental students is now specifically prescribed in an executive order of March 31 amending the Selective Service regulations. In a definition of "necessary employment" on the basis of essentiality to "the maintenance of the national health . . . ," the amended regulations include both dental students and students who have been accepted for admission to dental school. Deferment depends upon certification by the school that the student is "satisfactorily pursuing a full-time course of instruction leading to his graduation."

Apart from those studying in the healing arts professions, classification of college students by local Selective Service boards will be based either on the student's scholastic standing or on his score in an aptitude test to be administered by Selective Service. The first of the nationwide tests is scheduled to be held May 26 at approximately 1,000 centers throughout the country. Only students already in college, who intend to request occupational deferment, will be allowed to take the test, a Selective Service spokesman stated.

UNIVERSAL MILITARY SERVICE AND TRAINING BILL

After passage by the House, on April 13, of a bill to provide for a three-year extension of the draft, a conference committee of the House and Senate was set up to iron out the differences between the bills from the two houses.

The House bill provided authority to induct men at age 18½, 26 months of service, and for a five-member commis-

sion to be set up to establish a plan for universal military training to go into effect by a later Act of Congress.

The Senate bill provides for indefinite extension of the draft, authority to draft men at age 18, 24 months of service, and authorization for six months' military training for all men at age 18, in a program to be instituted by the President or concurrently by Congress when the need for military service is not immediate, and to be administered by a civilian board.

DRAFT CALL FOR MAY

Selective Service Director Lewis B. Hershey on April 11 ordered a delay in the May draft call until it is known what the requirements of the services will be. The draft call was reduced from 60,000 to 40,000 in March.

1-A AND 1-AO CLASSIFICATION AND ARMY COMMISSIONS

Classification in 1-A and 1-AO of special registrants in Priorities I and II must now be reaffirmed by State Selective Service directors before the Army will offer commissions to such registrants, according to recent instructions issued by the Army Adjutant General. The order states also that State Selective Service directors must satisfy themselves that their local boards have obtained the advice of local advisory boards regarding the present availability of registrants.

Special registrants who expressed willingness to accept a commission but are not now classified 1-A or 1-AO will not be offered commissions unless they reaffirm a desire for a commission and volunteer for active duty, or until they have been reclassified, the order states.

ARMY COMMISSIONS ITS FIRST WOMAN DENTIST

The first woman dentist to receive an Army commission, Helen E. Myers of Philadelphia and Lancaster, Pa., reported March 21 for duty at Camp Lee, Va. She entered the service with the grade of captain.

Since graduation from Temple University dental school in 1941, Dr. Myers has practiced in Philadelphia where she shared her father's dental office, and at the same time has maintained her own office in Lancaster, Pa. She is a member of the American Dental Association, the Association of American Women Dentists, the West Philadelphia Odontographic Society, the Soroptomist International Association, and the Lancaster Chamber of Commerce.

Legislation established last August authorizes the appointment of female professional personnel, for the first time, in any Reserve Corps of the Army Medical Service. As officers on active duty, women dentists appointed in the Reserve will be given the same opportunities for clinical practice and advancement now available to male personnel of the Army Dental Corps in comparable grades, and will receive the same pay, allowances, and retirement benefits. They are eligible for service in every type of military medical facility, except at forward installations in combat zones.

VA INTERPRETS GI BILL CUT-OFF DATE RULES

With the approach of the July 25 cut-off date for training under the GI Bill, Veterans Administration has issued an interpretation of the regulations for special cases.

In general, veterans discharged on or before July 25, 1947, who are planning training under the GI Bill, must begin their training before July 25, 1951. Veterans discharged after July 25, 1947, have four years from their date of discharge in which to begin training.

Under a special provision, veterans who complete predental training under the GI Bill but have not gained admit-

tance to dental school will be permitted to start their advanced training whenever an accredited school has room for them, even if it is after the cut-off date. VA explains that this provision applies also to veterans whose predental training under the GI Bill ends after the cut-off date.

Veterans who started GI training but interrupted it to return to military or naval service also will not be bound by the cut-off date, but will be permitted to resume their training after their discharge.

Vocational Rehabilitation Act • Veterans planning training under the Vocational Rehabilitation Act (Public Law 16) may begin training at any time after discharge but must complete it by July 25, 1956, the wind-up date. Veterans disabled after fighting started in Korea have nine years from the end of the current emergency to complete training under Public Law 16.

Dental Education

A.A.D.S. PRESIDENT SUGGESTS ADDITIONAL YEAR OF TRAINING

Nearly 500 dental educators attending the twenty-eighth annual meeting of the American Association of Dental Schools at French Lick, Ind., March 19-20, heard Charles W. Freeman, president, recommend a fifth year of experience and training for dental school graduates.

At the same meeting Leo J. Schoeny, dental member of the Health Resources Advisory Committee of the National Security Resources Board, predicted a shortage of 9,200 practicing dentists in the U.S. by 1954 unless dental schools expanded enrollments and adopted an accelerated program.

Dr. Freeman said that the fifth year of experience should be acquired by the graduate as a teacher, research worker, intern, graduate or postgraduate student, or in military service or a clinic. He recommended also that all dental schools follow the same time-table for the selection of students, so that students applying for admission could be notified at approximately the same time.

The complete text of Dr. Schoeny's presentation, which he gave also at the March 19 meeting of the Board of Trustees of the American Dental Association, appears on page 548 of this issue.

After meeting in conference sessions on nearly a dozen dental educational subjects, the A.A.D.S. installed Ernest G. Sloman of San Francisco as president to replace Dr. Freeman whose term expired; and named Wendell D. Postle of Columbus, Ohio, president-elect, Walter H. Wright of New York vice-president, and Marion W. McCrea of Baltimore secretary-treasurer.

Date of the next meeting was set for March 22-23, 1952, following the meeting of the International Association for Dental Research in Colorado Springs, Colo.

SCHOOL OF AVIATION MEDICINE NEEDS OLD DENTAL JOURNALS

Dentists are asked to donate old dental journals and textbooks to the library of the U.S. Air Force School of Aviation Medicine at Randolph Field, Texas.

The request came as a personal plea to members of the Association from Maj. Warren R. Hester of the department of dentistry of the USAF School, who states that clinical and research journals particularly are needed. He explains that at present the library is stocked mainly with literature of interest to physicians and basic scientists, because it is only recently

that dentistry has been recognized as an important science in aviation medicine. Since the establishment of the department of dentistry on an equal basis with other departments in the clinical medicine division, the library has subscribed to current dental journals and textbooks, but has had no funds for the purchase of older literature, he states.

ILLINOIS EXPANSION PLANS INCLUDE NEW BUILDING

The University of Illinois has announced plans for a proposed new unit of its Dentistry-Medicine-Pharmacy building to permit a 33 per cent increase in undergraduate enrollment, for which it is seeking an appropriation of $6,340,000 from the State General Assembly.

Andrew C. Ivy, vice-president of the University in charge of the Chicago professional colleges, in announcing the plans, said that last fall there were 236 qualified applicants for admission to the dental school but only 75 could be admitted. The new building, if it is secured, will not only permit a dental school enrollment of 90 per class and substantial increases in the pharmacy and medical school enrollments, but will allow a total increase of 536 students in the undergraduate enrollment. In addition, it will accommodate 150 student nurses and 200 graduate students in the health sciences, he stated.

The plans were announced at a joint meeting of officers of 27 health organizations, including the Chicago and Illinois State Dental Societies, called for the purpose of planning expansion of the teaching and research programs in the undergraduate enrollment in the three schools.

SYMPOSIUMS, CLINICS AND REFRESHER COURSES

Emory • Emory University School of Dentistry, Atlanta, Ga., offers a program of postgraduate dental clinics May 31-June 1, preceding the University's commencement exercises and alumni homecoming day program on June 2.

The program will include a symposium on oral cancer on May 31, and three dental prosthetic seminars on June 1.

Attendance is limited to 100. Registration fee is $10.

Further details may be obtained by writing to the dean, John E. Buhler, Emory University School of Dentistry, 106 Forrest Avenue N.E., Atlanta 3.

Indiana • Indiana University School of Dentistry has announced a symposium on headache, and a refresher course in prosthetic dentistry, to be held in June.

A one-day symposium on "Differential Diagnosis of Pain in the Head" will be held June 20. Speakers include C. M. Charles of St. Louis, associate professor of anatomy, Washington University School of Medicine; R. L. Webb, head of the department of anatomy at Indiana University; and H. B. G. Robinson of Ohio State University College of Dentistry, as well as dentists and physicians from Indianapolis.

A refresher course in prosthetic dentistry is scheduled for June 25-28. It will consist of lectures and demonstrations by members of the faculty of the dental school.

Detailed information may be obtained by writing to the dean, Maynard K. Hine, 1121 West Michigan Street, Indianapolis 2.

California • A group of eight courses in airbrasive technics is offered by the College of Dentistry of the University of California during the summer. The first class will meet during the week-ends of June 29 and July 2. The other classes, which will be conducted on a six-hour-a-day basis, will meet July 27-31, August 3-7, August 10-14, August 17-21, August 24-28, August 31-September 4, and September 7-11.

Tuition is $150 and enrollment in each course is limited to 12.

Further information may be obtained by writing to Gordon M. Fitzgerald, chairman, Continuation Study Program, University of California Medical Center, San Francisco 22, Calif.

International

NORWAY OPENS NEW INSTITUTE OF DENTAL RESEARCH IN OSLO

The new Norwegian Institute of Dental Research, in Oslo, was formally opened March 16 at ceremonies at which the Norwegian Ministers of Health and Education, the chairman of the Council for General Research, and Bierger Nygaard Ostby, director of the Institute of Dental Research and president of the Norwegian Dental Society, officiated. Carl L. Sebelius of Nashville, in Europe on a World Health Organization fellowship, attended the banquet following the ceremonies at which the secretary general of the Norwegian Dental Society, Knut Gard, presided.

Dr. Gard, who visited the Central Office in Chicago early in April, said that the Institute is equipped and operated with the proceeds from a Government operated national football pool based on the results of football games in in England and Norway. The proceeds from the pool are divided between sports and general research, he explained. After a sum has been set aside each year for sports purposes, the remaining sum—which last year amounted to approximately $1,500,000—is disbursed by a Council for General Research comprised of representatives of nongovernmental scientific and educational organizations, including the Norwegian Dental Association. Approximately $10,000 was provided by the Council for equipment of the Institute, and $40,000 has been allotted for its first year of operation, Dr. Gard reported.

DENTAL ASSOCIATION OF INDIA ANNOUNCES OFFICERS FOR 1951

The All India Dental Association, held its sixth annual conference February 16-19 in Bangalore and has announced the following newly elected officers for 1951: M. K. Patel of Bombay, president; S. P. Kapadia of Bombay, president-elect; H. D. Merchant of Bombay, C. S. Shah of Rajkot, and R. Krishna of Delhi, vice-presidents; Capt. S. Bratt of New Delhi, honorary general secretary; S. C. Sen Gupta of New Delhi, honorary joint secretary; A. K. Dutt of Delhi, honorary assistant secretary; P. C. Jayna of Delhi, honorary treasurer; K. L. Shourie of Bombay, editor of the journal; and U. S. Malik of New Delhi, public relations officer.

The Delhi State Branch of the Association observed a "Dental Health Week" last November with a scientific session for the profession and an exhibition which drew an attendance of 6,000 persons. Children in more than 30 schools and colleges participated in a "Best Teeth" contest and a poster contest. The opening address was made by the Indian Minister of Health, the Honorable Raj Kumari Amrit Kaur, who is also president of the World Health Organization.

FRENCH DENTAL WEEK TO BE HELD IN PARIS IN JUNE

The 60th Dental Congress ("Dental Week") will be held in Paris May 31-June 6. Sponsored by the French national federation of dental organizations (Confédération Nationale des Syndicats Dentaires), the event will constitute a review of a half century of progress in dental science, technics, and education. A technical exhibit covering 4,000 meters of floor space will be included.

American dentists are invited to attend and can obtain further details by writing to Le Secretaire de la Semaine Odontologique, 31 Rue Tronchet, Paris VIII.

Three weeks after presiding at opening ceremonies at the Norwegian Institute of Dental Research in Oslo (see story, page 586), Knut Gard, secretary-general of the Norwegian Dental Association, was in Chicago conferring with his American colleagues. He is shown here in the Central Office on April 13, discussing his itinerary with Harold Hillenbrand (left), secretary of the American Dental Association, and Lon W. Morrey (right), editor of THE JOURNAL. While here he will visit a number of dental schools as he is particularly interested in American methods of dental education and in the standards for dental specialists.

MILITARY MEDICINE CONGRESS TO FOLLOW F.D.I. MEETING

The thirteenth International Congress of Military Medicine and Pharmacy will be held in Paris June 17-23 following the meeting of the Fédération Dentaire Internationale to be held in Brussels June 9-16.

Information may be obtained by writing to the general secretary, André Boucher, 37 Rue de Rivoli, Paris IV.

ARGENTINE DENTISTS INVITE U.S. COLLEAGUES TO MEETING

An invitation to members of the Association to participate in the tenth congress of the Argentine Dental Association (Association Odontologica Argentina) has been received by Harold W. Oppice, president, from Pedro Saizar, president of the Argentine Association.

The last congress, held in Buenos Aires in 1942, was attended by Stanley D. Tylman, chairman of the Council on International Relations of the Association. Dr. Tylman reports that this is a large congress and that usually every Latin-American country is represented. This year's program includes 120 demonstrations, 10 question and answer periods, and scientific and technical exhibits.

Argentine Orthodontic Society • The Argentine Orthodontic Society (Sociedad Argentina de Ortodontocia) has announced its newly elected officers for the year. Members of the Board of Directors are: Héctor F. Viale, president; Ramón Torres, vice-president; Elio A. DeMaría and Román Santini, secretary and assistant secretary respectively; Jacobo Guidalevich and Alberto O. del Intento, treasurer and assistant treasurer respectively; Tomás M. Dodero, Jorge A. Bisi, Rodolfo Stapler, and Orfilio I. Caffese, voting members; and Albert C. Moreira Lescarret, alternate.

A three-member financial board and a five-member honorary tribunal also were elected.

BRAZIL ALLOWS PRACTICE OF DENTISTRY BY NONCITIZENS

Foreign dentists may now practice their profession in Brazil without becoming naturalized citizens of that country, according to an announcement from the University of Sao Paulo.

Although a recent change in the Brazilian constitution removes the compulsory citizenship requirement, a dentist with a dental degree from a foreign university who wishes to practice in Brazil must first have his diploma examined by the Brazilian State Board and then pass the final examinations given to dental students. After fulfilling these requirements, he must have his diploma authenticated by the Ministry of Finance, and apply for registration by the Department of Higher Education and the National Health De-

partment. He will then be permitted to practice dentistry on the same footing as Brazilian dentists, the announcement states.

CHILEAN DENTISTS TO SPONSOR INTERNATIONAL CONGRESS

Santiago, Chile, is to have an international congress in November, sponsored by the Colegio de Dentistas de Chile, the Universities of Chile and Concepcion, and the Chilean Government, according to Raúl Muñoz Inza of Santiago.

Invitations to appear on the program have been sent to Philip Jay and K. A. Easlick of Ann Arbor, and to Maury Massler and Leonard S. Fosdick of Chicago, as well as to leading dental investigators in France and Switzerland, it is reported.

Further information may be obtained by writing to the Colegio de Dentistas de Chile, Huerfanos 634, Santiago, Chile.

General

DENTAL ANESTHESIA GROUP TO MEET IN CLEVELAND IN JUNE

The Society of Clinical General Dental Anesthesia will hold its third annual meeting June 6 at St. Vincent's Charity Hospital, Cleveland. Demonstrations in oral surgery will be included on the program, and discussions will be led by L. F. Prendergast, chief of the dental department at Charity Hospital.

Further details may be obtained from the secretary, Sidney Forman, 15003 St. Clair Avenue, Cleveland 10.

ACADEMY OF DENTAL MEDICINE TO MEET IN ATLANTIC CITY

The American Academy of Dental Medicine will meet June 22-24 in Atlantic City. Details may be obtained by writing to the secretary, W. M. Greenhut, 124 E. 84th Street, New York 28.

DEAN WRIGHT TO RECEIVE SIGMA EPSILON DELTA AWARD

Walter H. Wright, dean of New York University College of Dentistry and professor of prosthetic dentistry, will be named "1950 Man of the Year" by Sigma Epsilon Delta dental fraternity on May 26, when he will receive the fraternity's annual reward for "untiring and meritorious service to the dental profession."

The award will be presented at the golden anniversary convention of the fraternity May 26 at Totem Lodge, Averill, N.Y.

ALL BUT 3 DENTAL SCHOOLS NOW IN USPHS CANCER PROGRAM

All but three of the nation's 42 dental schools are now participating in the U. S. Public Health Service program to "strengthen professional training in cancer," Federal Security Administrator Oscar R. Ewing said recently when he announced a grant for cancer teaching to Howard University College of Dentistry for the first time, and renewals of grants to ten other dental schools.

Following are the dental schools and the amounts of the teaching grants:

University of Southern California College of Dentistry, $5,000; Chicago College of Dental Surgery, Loyola University, $5,000; University of Illinois College of Dentistry, Chicago, $5,000; Washington University School of Dentistry, St. Louis, $4,590; University of Oregon Dental School, Portland, $4,981; Meharry Medical College School of Dentistry, Nashville, Tenn., $5,000; University of Texas School of Dentistry, Houston, Tex., $5,-

The distinction of being the first woman dentist ever to be commissioned in the Army Dental Corps goes to Helen E. Myers of Philadelphia and Lancaster Pa., according to Maj. Gen. Walter D. Love, chief of the Army Dental Corps, who is shown here congratulating Captain Myers when she reported for duty March 21. She was assigned to Camp Lee, Va. (Story on page 583.)

000; University of Washington School of Dentistry, Seattle, $5,000; Marquette University Dental School, Milwaukee, $5,000; Georgetown University School of Dentistry, Washington, D.C., $5,000; and Howard University College of Dentistry, Washington, D.C., $5,000.

SUPPLY FREE MEDIA FOR OFFICE ROOT CANAL CULTURES

Vials of brain-heart infusion broth for use in making cultures from root canals are supplied free to dentists in Washington State in a project entitled "The Washington Plan for Controlled Root Canal Therapy" announced jointly by the University of Washington School of Dentistry and the State Department of Health. Cultures must be incubated in the dental office but instructions for taking the culture and evaluating the results are supplied with the media.

MICHIGAN OFFERS TWO-YEAR FELLOWSHIPS IN PEDODONTICS

Two graduate fellowships in dentistry for children, to begin September 1, are offered at the University of Michigan by the Charles Stewart Mott Foundation of Flint. They provide 12 months' study at the W. K. Kellogg Foundation Institute of Graduate and Postgraduate Dentistry of the University, with a stipend of $125 a month and free tuition, followed by 12 months' service in the Children's Foundation Health Center, Hurley Hospital, Flint, at a salary of $4,000, during which work on a thesis for a master's degree can be completed.

Further information may be obtained by writing to Kenneth A. Easlick, professor of dentistry, School of Dentistry, University of Michigan, Ann Arbor, Mich.

I.A.D.R. MEETING DRAWS LARGE NONMEMBER ATTENDANCE

More than half of the 392 persons who attended the twenty-ninth annual meeting of the International Association for Dental Research in French Lick, Ind., were nonmembers, according to Edward H. Hatton of Chicago, who is beginning his fourteenth year as secretary-treasurer of the organization.

Election of the following officers also is reported: Leonard S. Fosdick of Chicago, president; Maynard K. Hine of Indianapolis, president-elect; Francis A. Arnold, Jr., of Bethesda, Md., vice-president; Edward H. Hatton of Chicago, secretary-treasurer; and H. B. G. Robinson of Columbus, Ohio, editor.

The program included 112 research papers and 58 papers read by title, on subjects ranging from electron microscope studies, and reports dealing with penetrability of human teeth to radioactive particles and chemical ions, to tests for effectiveness of masticatory performance. Numerous studies on caries control and on bacteriological subjects also were reported.

Date of the next meeting was set for March 21-23, 1952, preceding the meeting of the American Association of Dental Schools in Colorado Springs, Colo.

FILM ON CASTING OF DENTAL GOLD ALLOYS IS AVAILABLE

A 16 mm., 18½ minute, sound and color motion picture film on "The Casting of Dental Gold Alloys: Thermal Expansion Technique" is now available for professional use on loan or purchase. Produced by the National Bureau of Standards in cooperation with the Council on Dental Research of the Association, the film demonstrates step by step the making of accurately fitting dental castings and the necessity for proper selection and use of materials.

The film may be obtained from the Office of Scientific Publications, National Bureau of Standards, Washington 25, D.C. Requests should be submitted at least 30 days in advance of the day the film is to be shown.

KEIFER GETS CDA HEALTH JOB: REPLACED IN NSRB BY AUFRANC

Norman C. Keifer has been named director of the Division of Health Services and Special Weapons Defense in the Civil Defense Administration, to work under Col. William L. Wilson whose appointment as assistant administrator of CDA in charge of health and welfare was announced in March.

Dr. Keifer was formerly director of the Health Resources Office, National Security Resources Board. Replacing him with the title of acting director will be Will H. Aufranc, on loan from U.S. Public Health Service where he was assistant chief of the Division of Venereal Diseases, Bureau of State Services.

SOUDER RECEIVES DEPARTMENT OF COMMERCE AWARD

Wilmer Souder, consultant to the National Bureau of Standards and well known investigator in the field of dental materials, has been awarded a U. S. Department of Commerce Award for Meritorious Service, and a citation for "outstanding accomplishments over a period of many years in the initiation and development of the technology of dental materials."

Dr. Souder, who is completing his thirty-sixth year of service to the Bureau, is an honorary member of the Association, an honorary fellow of the American College of Dentists, and was president of the International Association for Dental Research in 1940.

ORAL PATHOLOGY ACADEMY TO HOLD SYMPOSIUM THIS MONTH

The mid-year symposium of the American Academy of Oral Pathology will be held May 19 at the Armed Forces Institute of Pathology, Washington, D.C. Subject of the symposium will be "Dermatologic-like Lesions of the Oral Cavity," and the moderator will be Elson B. Helwig, chief of the section of dermatologic pathology of the Armed Forces Institute.

Fellows, members of the Academy and their guests are invited to attend. Registration fee is $5.00 and enrollment is limited to 60.

Reservations should be made through the secretary, Col. J. L. Bernier, Armed Forces Institute of Pathology, Washington 25, D.C.

The Reader Comments

THE JOURNAL *devotes this section to comment by readers on topics of current interest to dentistry. The editors reserve the right to edit all communications to fit available space and require that all letters be signed. Signatures will be deleted before publication at the request of the author. Printed communications do not necessarily reflect the opinion or official policy of the Association. Your participation in this section is invited.*

The Editor

A SUGGESTION

It is suggested that organized dentistry consider an attempt to have such legislation enacted which will make it impossible to procure artificial teeth except by the prescription of a licensed dentist.

Such legislation would eliminate the illegal practice of dentistry. If he is unable to procure teeth the illegal practitioner cannot flourish. It also would eliminate mail order dentistry, raise the prestige of dentistry in the public esteem where it is often considered at no higher level than the dental laboratory, effectively check the attempts of the organized dental laboratory technicians to secure licensure to practice prosthetic dentistry, and eliminate the undignified methods now used to trap the suspected laboratory technician.

No one but a dentist is qualified by education and licensure to select the proper mold, type and shade for patients in need of dental prosthesis. On this basis it should be possible to have such laws enacted which will protect the dentist and the public from charlatans.

Herman Cohen, D.D.S.,
West Orange, N. J.

AN AUTHOR REPLIES

I read with great amusement the answer of Dr. Lundquist to Dr. Bloom's letter concerning the review of my book, *Periodontia.* I say "with amusement" because of the tenor both of Dr. Lundquist's review and his answer, for I do not feel that one could seriously argue with him. It must, therefore, be placed on a lighter plane.

It is, however, with regret that I noted the last paragraph of Dr. Bloom's original letter, which he recently showed me, was entirely deleted and I wish to quote:

"It is the custom amongst scientific men not to criticize the work or ideas of another unless they present well founded facts to substantiate their arguments. I presume that this custom was dictated in part by consequences which such action would bring upon himself and also because of a respect for a contemporary of proven ability. The reviewer states '. . . by quoting authors who supposedly have demonstrated the implied facts.' This was in relation to a reference to observations made by Dr. J. Weinmann concerning the path taken by inflammation in periodontal bone and fibers. Goldman agrees with the findings of Weinmann and takes pain to illustrate them (Figs. 86-91). He also points out that occasionally the infiltrate is seen in the periodontal membrane. The reviewer, however, proceeds confidently to refute the 'implied facts' of these men with his opinions for which he gives no reference as to his data."

I would appreciate having this published for it puts the whole correspondence in the proper light. May I thank you for your courtesy.

Henry M. Goldman, D.M.D., Boston

IN CONCLUSION

The questions raised relative to my review of Dr. Goldman's book, *Periodontia,* cannot be resolved on the basis of well selected bits of evidence which may be found in published articles or books, because evidence based upon an analysis of serial sections might lead to other conclusions. I realize, of course, that printing serial sections is not feasible. Therein lies the weakness of the above mentioned evidence.

It is quite obvious that Dr. Goldman doubts my ability to make such an analysis as I have already questioned a few interpretations he has made. Under the present circumstances further discussion would be fruitless. Yes, the controversy might be dismissed as an amusing episode in which the book reviewer had the temerity to disagree with a few interpretations made in a well gotten up and well written book on periodontia.

G. R. Lundquist, M.S., D.D.S., Chicago

Book Reviews

DIAGNOSIS AND TREATMENT OF TUMORS OF THE HEAD AND NECK

By Grant E. Ward, M.D., D.Sc., and James W. Hendrick, M.D., M.S. First edition. 832 pages with 637 illustrations and 9 color plates. Index. Price $15. Baltimore, Williams & Wilkins Co., 1950.

In the preface to this book the authors state, "The purpose of this book is to furnish the reader practical information regarding the diagnosis and treatment of tumors of the head and neck. It is written for the clinician, be he specialist or general practitioner. The importance of early diagnosis is stressed and the proper choice of treatment is emphasized. Each year a considerable number of patients come to the clinics in advanced stages of cancer who could have been cured had the clinician first consulted recognized the disease and insisted on proper treatment. The value of biopsy as a diagnostic study and guide to therapy is mentioned repeatedly.

"A chapter on embryological considerations of the head and neck is included to assist in understanding the types of tumors encountered in these areas. A discussion of pathology accompanies each section to aid in diagnosis and to lay the foundation for treatment. Sir William Osler has aptly said, 'As is our pathology, so is our practice.' Since the management of patients with tumors in the regions covered in this volume frequently requires knowledge and experience in several fields of medicine, some of the chapters and sections are contributed by specialists to make the presentation of material authentic."

The authors have been eminently successful in carrying out their purpose. In spite of the fact that this is a large book, it is well organized and well written. Each of its 21 chapters is followed by a list of references. The text is supported by an unusual number of illustrations of high quality, many of them in color.

All dentists have the responsibility for the early recognition of lesions which may be malignant tumors of the face, the lips, and the mouth. Most dentists will choose to refer these patients for treatment, while many treat the nonmalignant tumors of the mouth. This volume contains a discussion of both types of tumors and describes the methods of obtaining a biopsy in doubtful cases which makes it a valuable book for differential diagnosis and a guide to treatment.

The final chapter, a portion of which is written by a dentist, deals with the rehabilitation of the cancer patient. Many prosthetic appliances are described. This important phase of the rehabilitation of the cancer patient offers an opportunity to the dentist to use his skill and to be of unusual service.

This book, thoroughly illustrated, well printed and readable, completely covers the field of malignant and nonmalignant tumors which are of direct concern to the dentist. It would be a valuable addition to his library.

Warren R. Schram

A SHORT HISTORY OF PHYSIOLOGY

By Kenneth J. Franklin, D.M. Second edition. 147 pages with 17 illustrations. Index. Price $2. New York, Staples Press, 1949.

This little volume is the first history of physiology published since Michael Foster's more elaborate work in 1901.

The last chapter in Franklin's book deals with the developments during the nineteenth century and brings Foster's book up to date. It includes a host of names familiar to all students of the subject.

It is, however, the earlier chapters which are of greatest interest. In them the author traces the development of knowledge of the operations of the living body from ancient times to the Dark Ages. Here one becomes conscious of the slow development from what may perhaps be called zero to that bearing some remote resemblance to modern physiological thought. We are justified in describing the starting point as zero when one reflects that Aristotle, in the third century B.C., regarded the brain as an organ for cooling the heart by the secretion of pituita (a phlegm secreted by the pituitary body). In the sixth century B.C., Alcmaeon held that goats breathed through their ears. It seems almost impossible that such and similar notions, which to us are most ridiculous, could ever have been seriously entertained.

One of the causes of this slow growth of physiological knowledge during these early centuries the author sums up in a pithy quotation from John Hunter: "But why think? Why not try the experiment?"

As the author stresses on several occasions, the remarkable strides in our knowledge during

the last few hundred years as compared with the previous thousand years lies in the method of approaching a problem, experimentation.

A second factor credited with the rapid progress after the Dark Ages is the breaking away from authority. For more than a thousand years the teachings and writings of Galen (second century A.D.) were held to be authoritative; to dispute what Galen had said was rank heresy. But with the coming of the Renaissance man's mind was freed from this bondage, independent thinking became the order of the day, progress was now possible.

In thus tracing the growth in the methods of man's thinking concerning the operation of the human body lies much of the interest in this book.

The physical appearance of the book—its type, leading, format and binding—is excellent. The portraits of 16 physiologists adds much to its value.

W. D. Zoethout

ORAL AND FACIAL CANCER

By Bernard G. Sarnat, M.D., and Isaac Schour, D.D.S., Ph.D., Sc.D. 300 pages with illustrations. Index. Price $6. Chicago, Yearbook Publishers, Inc., 1950.

The opening statement in the preface to this excellent discussion of the cancer problem states what is well known to every student of the subject, "Cancer is the second greatest cause of death in the United States." Dentistry as a health agency must assume tremendous responsibility in the early recognition, and in the control, of this dread disease. As custodians of the oral cavity and its associated structures, dentists must assume an equal responsibility with physicians in the control of cancer. Oral diagnosis is part of dental practice and the modern dentist must consider himself qualified and responsible for the prolonging of human life. The dentist by his daily observation of the oral tissues is in a better position to observe early mucosal and bone changes than is the physician. As oral diagnosticians, dentists should so train themselves to render a true health service. The present day dental student is receiving competent instruction in the early recognition of cancer and precancerous lesions, and it is hoped that this will in time help reduce the mortality rate of mouth cancer.

Part I of the book deals with the public health aspects of cancer and should be of as great interest to the dentist as to the physician.

Part II, dealing with the present status of cancer research, will give the reader a comprehensive understanding of the problem as it is understood today. Proper assimilation of the contents of this part of the book will give the dentist a breadth of vision he might not have otherwise.

Part III, dealing with general clinical considerations, emphasizes the role that the dentist can assume in the control of the disease. It points out that a complete oral examination calls for more than examination of the teeth and gingivae alone. The method of examination recommended points out the changing concept of dental practice and the need for a broader view of dentistry than has been assumed in the past.

An illustrated description of cancer lesions involving the oral cavity and associated structures is excellent. Chapter 14 deals, in a comprehensive manner, with oral manifestations of leukemia. The dental reader should find this part of the book extremely practical and an aid in suspecting the presence of this disease. Nonrecognition of the oral manifestations of this disease often leads to heartaches when surgery has been performed.

The occupational hazards from exposure to radiation is well covered in Chapter 11 and should interest every dentist who uses the x-ray in his practice.

A chapter on prosthetic reconstruction of facial defects following treatment of cancer is of particular interest to the prosthodontist who by training is especially qualified to render this type of service. The skill of the prosthodontist is second only to that of the skilled surgeon in rehabilitating unfortunate victims of cancer.

The book has an appendix giving the, "Do's and Dont's." It also states danger signals of oral and facial cancer, and lists questions for students of the subject.

It is well written, convenient in size, and highly recommended.

James R. Cameron

ANTIPYRINE: A CRITICAL BIBLIOGRAPHIC REVIEW

By Leon A. Greenberg, Ph.D. First edition. 135 pages. Index. Price $4. New Haven, Conn., Hillhouse Press, 1950.

This book is the third in a series of five similar works on analgesic drugs by various authors. The first two, published in 1946 and 1948 respectively, deal with acetanilid and the salicylates. The fourth and fifth, now in preparation, will cover the bromides and phenacetin.

The principal contribution made by the series thus far lies in extensive bibliographies.

The book on antipyrine, a drug which is probably much less widely used than the other analgesics covered by the series, has a bibliography of 1,735 titles.

The brief and sometimes sketchy comments and discussion in the review section of the book on antipyrine are only indicative of the available facts. A good understanding of the facts can be obtained best by reading the original literature, a laborious procedure which would be practical only for specialized investigators.

This volume should be in all medical and pharmaceutical research libraries. It is a good source of literature references for physicians, dentists and other scientists who are engaged in pharmacologic research, but will not be very useful for those whose work is primarily clinical.

Donald A. Wallace

CEREBRAL PALSY

By John F. Pohl, M.D. Price $5. St. Paul, Bruce Publishing Co., 1950.

Cerebral palsy is a common affliction evident at birth and persisting throughout life. The author indicates the need for early diagnosis, personal care, social adjustment, education, psychological management of the child and family, and training for useful work. The fundamental approach is to teach the child to help himself under expert guidance. After a consideration of the medical problems involved in various types of palsy, the author outlines forms of neuromuscular training, occupational therapy and improvement in personal development. There is no question that treatment based upon physiologic and rational therapeutics produces amelioration of this crippling group of diseases.

I. N. Kugelmass

ENZYMES, GROWTH AND CANCER

By Van R. Potter, Ph.D. First edition. 64 pages. Price $1.85. Springfield, Ill., Charles C Thomas, 1950.

In a monogram of this nature, the background, fluency and understanding of the author are the most important factors. Dr. Potter writes with authority because of his extensive experience in the field of enzymology. His literary approach is refreshingly frank and explanatory. There is ample evidence that considerable research and study have gone into the preparation of this little handbook.

In the introduction, the author states, "In response to a request for a series of lectures, a number of premises were developed on enzymology in relation to the cancer problem. . . . It will be obvious that these premises do not represent concepts that originated with the present author." These lectures were presented while the author was Commonwealth visiting professor of biochemistry at the University of Louisville in March, 1947.

Aside from the introduction, the subject matter is divided into five chapters entitled "The First Premise: The Role of Enzymes," "The Second Premise: Determination of Enzymes," "The Third Premise: Organization of Enzymes," "The Fourth Premise: Factors Influencing Enzyme Activity" and "The Fifth Premise: Enzyme Inhibition and Chemotherapy." The text is supplemented with a reference index. It is disappointing that no subject index is included.

This monograph contains much important, concentrated information. It can be highly recommended to workers in this field.

E. Alan Lieban

THE NUTRITIONAL IMPROVEMENT OF LIFE

By Henry C. Sherman. 270 pages with 13 tables. Index. Price $3.75. New York, Columbia University Press, 1950.

This book develops the theme that "Nutrition is everyone's adventure." Sherman states that it was prepared to aid in building a sound understanding of what science has now shown to be practicable in the improvement of life processes through nutritionally guided use of food.

Chapters 2 through 7 review the progress of nutrition by decades from its modern beginning in the 1890's. The second half of the book presents the principles and practice of nutrition, describing the degrees of positive health and ways in which optimal levels may be obtained. Sherman develops further the conception that man can now become more largely the builder of his own life history; "that we can and should both add life to our years, and add years to our lives."

The second half of the book can be easily understood by those untrained in nutrition, and yet is sufficiently scientific to serve as an excellent summary for the nutritionist. That portion of the book, beginning with chapter 8, including also the introductory chapter 1, could well be published as a separate handbook on nutrition, in a pocket-size edition. This book is highly recommended.

Dorothea F. Radusch

ORAL PATHOLOGY

By Kurt H. Thoma, D.M.D. Third edition. 1,592 pages with 1,660 illustrations, 78 in color. Index. Price $17.50. St. Louis, C. V. Mosby Co., 1950.

This book without any question has outstanding merit. It is by far the best book of its kind in the area of oral pathology. Its contents should be familiar to both teachers and practitioners of dentistry because of the inclusiveness and authority with which the subject is covered. It should be noted, however, that those phases of oral pathology in which the author excels, such as tumors and disorders of growth, surgical pathology and endocrine disturbances, are handled with a higher degree of aptitude and authority than the remainder. This helps to heighten the favorable effect of the book as a whole and blind the reader to some defects, especially those of size and the needless use of many poor illustrations, especially those of histopathological material. This edition is not so different from the preceding two, reviewed in this JOURNAL in August, 1941 and June 1, 1944. The review of the first edition was critical of the histopathological illustrations and this criticism applies to this type of illustration in the present edition with undiminished emphasis. Here is an area in which there is a wide margin for improvement. There also should be better selection and adequate labeling. The generous use of bibliographies at the end of chapters carries a heavy responsibility. For example the chapter on dental caries is followed by nearly 300 citations of which all but about 50 go back more than 20 years. It may be that the effort to fit the text of the chapter onto the skeleton of this extensive bibliography has swollen the content beyond the level of desirability. Some small errors will be found, mostly errors in names such as Gove and Gove for Grove and Grove (p. 499) and M. T. Hauke for M. T. Hanke (p. 499).

Edward H. Hatton

TEXTBOOK OF ANATOMY AND PHYSIOLOGY

By Carl C. Francis, M.D., and G. Clinton Knowlton, Ph.D. Second edition. 624 pages with 365 illustrations, 31 in color. Index. Price $6.25. St. Louis, C. V. Mosby Co., 1950.

As the authors state in their preface, "the present text is not a continued book of anatomy and physiology bound together, but rather a textbook of anatomy-physiology in which the material is presented as one course. . . . The text includes the material as outlined by the National League of Nursing Education, and is organized according to the unit plan suggested in the curriculum guide."

In this second edition many of the original illustrations have been retained and others added. The material has been rearranged to produce a more thorough intergradation between anatomy and physiology. The text consists of 23 chapters, well illustrated and clearly written. Each chapter is concluded with review questions. A glossary of terms and ample index are included. A bibliography is completely lacking.

In their poor and limited description of the teeth, certain of the terms employed are not in common usage in dentistry. Examples are *adamant* for enamel, *substantia eburnea* or *ivory* for dentin, *cement* for cementum. It is hoped that if this text is to enjoy any further editions, the authors will familiarize themselves with the accepted dental terminology and tooth morphology.

This anatomy and physiology textbook is best suited for students of nursing, pharmacy or liberal arts where an all-embracing book is not required. It is easy to read and presents much general information concerning anatomy and physiology in a manner understandable to any college student. It is not comprehensive enough to serve as a textbook for medical or dental students.

E. Alan Lieban

THE PREPARATION OF PHOTOGRAPHIC PRINTS FOR MEDICAL PUBLICATION

By Stanley J. McComb, F.B.P.A. Publication No. 90, American Lecture Series. First edition. 69 pages with 72 illustrations. Price $2. Springfield, Ill., Charles C Thomas, 1950.

The title of this book is misleading as the author does not tell how to prepare photographic prints for publication. On numerous occasions he leaves the reader in midstream. On page 56, illustrated by figures 17A, B and C, the author describes a method of removing artefacts. In this reviewer's opinion, medical prints should never be retouched. It is always better to select a section which contains no artefacts.

For so few pages, the book abounds with references, 7 used and 15 not used. Naturally one does not expect to find a comprehensive text in such a small volume. The book is interesting and has good prints, but is nevertheless too sketchy and the author does not "follow through" on the various topics.

Waldemar A. Link

Current Literature

OBSERVATIONS ON EXPERIMENTAL DENTAL CARIES. XV. DOES GONADECTOMY INFLUENCE CARIES ACTIVITY?

H. Granados, J. Glavind and H. Dam. Brit. D.J. 89:67, August 4, 1950.

Thirty hamsters, 20 males and 10 females, were equally divided by litter-mate distribution into two groups. The experimental animals were gonadectomized and the controls were given a sham operation. All were maintained on a cariogenic high carbohydrate diet for 100 days. Gonadectomy resulted in an increased weight gain in both sexes. Gonadectomy did not affect caries susceptibility of the males, but increased, somewhat, caries scores in the females. These results differ from those reported by another investigator.

D. F. Mitchell

JOURNAL OF DENTAL RESEARCH
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*A BACTERIOLOGIC SURVEY OF GINGIVAL SCRAPINGS FROM PERIODONTAL INFECTIONS BY DIRECT EXAMINATION, GUINEA PIG INOCULATION, AND ANAEROBIC CULTIVATION, *Theodor Rosebury, John B. MacDonald and Ada R. Clark, New York, p. 718*

*THE PRODUCTION OF PERIODONTAL DISEASE IN THE HAMSTER AS RELATED TO DIET, COPROPHAGY, AND MAINTENANCE FACTORS, *David F. Mitchell, Rochester, N.Y., p. 732*

*EFFECT OF CERTAIN ABRASIVE MATERIALS ON TOOTH ENAMEL, *L. Rush Bailey and Ralph W. Phillips, Indianapolis, p. 740*

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THE PROBLEM OF GROUP SPECIFICITY IN ALLERGY TO LOCAL ANESTHETICS

P. Adler, L. Kesztyus and N. Simon

Rabbits were immunized by the chemospecific antigen procaine-azoprotein. Precipitation inhibition tests were carried out with the immune sera, using 25 different antigens, mostly local anesthetics (used clinically) and some kindred drugs. In precipitation inhibition tests a group specificity was observed. Precipitation was totally and partially inhibited by all esterified derivatives of para-aminobenzoic acid in which the aromatic amino group is free of side chain. To dentists allergic to one anesthetic of the procaine series, the use of local anesthetics with a different chemical structure and not a derivative of para-aminobenzoic acid is recommended.

A BACTERIOLOGIC SURVEY OF GINGIVAL SCRAPINGS FROM PERIODONTAL INFECTIONS BY DIRECT EXAMINATION, GUINEA PIG INOCULATION, AND ANAEROBIC CULTIVATION

Theodor Rosebury, John B. MacDonald and Ada R. Clark

Dark-field examination of suspensions in broth of gingival scrapings from 136 cases of gingival and periodontal disease and from 10 normal subjects points to a similar distribution of microorganisms throughout, with quantitative differences. The more characteristic fusospirochetal organisms were found in much smaller numbers in normal mouths than in pathologic processes. Large numbers of these forms were found in a slightly higher proportion of cases of Vincent's gingivitis than in other periodontal infections, while organisms of other types tended to be more common or more concentrated in periodontoclasia; but these differences seemed too small to have diagnostic value. Subcutaneous inoculation of guinea pigs with gingival scrapings from 40 subjects with various gingival or periodontal diseases yielded typical responses in from 75 to 92 per cent of trials. In a total of 104 trials in guinea pigs the proportion of positive responses was similar for the different clinical entities. The distribution of types of microorganisms in anaerobic cultures from 35 cases of gingival or periodontal disease, made either directly from gingival scrapings or from guinea pig lesion exudates, was again similar for the different diseases. Certain organisms cultured from gingival scrapings were not obtained in cultures from guinea pig lesions and are regarded as unessential to the pathogenic fusospirochetal complex. The data are considered to support the concept that a group of microorganisms indigenous to the mouth proliferates under pathologic conditions and contributes to gingival and periodontal disease.

THE PRODUCTION OF PERIODONTAL DISEASE IN THE HAMSTER AS RELATED TO DIET, COPROPHAGY, AND MAINTENANCE FACTORS

David F. Mitchell

Hamsters maintained on coarse laboratory chow diets developed mild interproximal periodontal lesions in 98 days. Fine, soft, high-carbohydrate diets for the same period resulted in moderate to severe generalized periodontal disease associated with soft subgingival accumulations. Restricted coprophagy and presence or absence of wood shavings did not influence the incidence of periodontal disease in hamsters. Hornification of palatal and esophageal epithelium was not influenced by diets employed here. Evidence indicated that the developing carious lesion and the periodontal lesion may be intimately associated when the animals are fed a high carbohydrate diet. Maintenance conditions useful for the production of measurable amounts of periodontal disease in large numbers of hamsters are described and a scoring method presented.

EFFECT OF CERTAIN ABRASIVE MATERIALS ON TOOTH ENAMEL

L. Rush Bailey and Ralph W. Phillips

The purpose of this study was to (1) measure accurately the amount of enamel removed by

various prophylactic materials and technics; (2) study the effects of the cleaning agent upon the tooth surface, both by luster measurements and microscopic examination; (3) determine the rapidity with which the luster can be restored to the tooth surface with a polishing agent. These studies included the use of a specially designed reflectometer for measuring luster changes. One of the technics investigated was the use of the Airdent which employs a stream of abrasive directed against the tooth surface by carbon dioxide pressure.

The data obtained indicated the enamel loss to be much greater with the airbrasive than with flour or fine pumice. This enamel loss, however, may not be of practical significance when the nozzle is not held too close to the tooth surface and the application time is not excessive. The luster of the tooth is greatly lowered by the airbrasive with only a very slight effect induced by flour or fine pumice. The type of surface produced by the airbrasive is different than that produced by pumice, but in all cases the original luster can be restored within 10 seconds by use of the polishing agent employed in the study.

DIMENSIONAL CHANGES IN DENTAL STONE AND PLASTER

W. T. Sweeney and Duane F. Taylor

The dimensional changes of gypsum products are very important for many applications. Dental stone and plaster are used for models and casts. A method for accurately measuring changes in linear dimensions is described. Direct comparison with gage blocks can be made. The dimensional change correlates with water loss. Loss of excess water, that is, more than sufficient to complete the crystallization to $CaSO_4 \cdot 2H_2O$, shows negligible dimensional change; from $CaSO_4 \cdot 2H_2O$ to $CaSO_4 \cdot 1/2H_2O$, gradual change, and $CaSO_4 \cdot 1/2H_2O$ to $CaSO_4$, very rapid change. This indicates that dental models at ordinary room temperature will change very little in dimensions from drying out but when heated will change seriously.

The method described provides a means of determining dimensional changes in gypsum products with high sensitivity (± 0.004 per cent).

THE EFFECT OF ZINC CHLORIDE AND POTASSIUM FERROCYANIDE AS A CARIES PROPHYLAXIS

Walter J. Pelton

Topical applications of zinc chloride and potassium ferrocyanide to the crowns of teeth have been advocated as an effective method of reducing the incidence of dental caries.

In this study 95 children, ages 8 to 14, received one application of the drugs to one-half of the upper teeth and one-half of the lower teeth. The untreated teeth in each child's mouth served as controls. The same dentist made the pretreatment and posttreatment examinations and he had no knowledge of which quadrants of the mouths were being used for the experiment or the controls.

No protection against dental caries of the deciduous or permanent teeth could be detected 13 months after the application of zinc chloride and potassium ferrocyanide.

VITAMIN REQUIREMENTS OF ORAL LACTOBACILLI

Stewart A. Koser and Barbara Jane Fisher

The vitamin requirement of 26 strains of oral lactobacilli was studied. These cultures were obtained from carious lesions, plaques, and saliva; 11 of them were laboratory stock cultures, the other 15 were recently isolated.

From 4 to 6 vitamins were required by the different cultures for growth in a basal medium of casein digest, glucose, acetate, and salts. Although this growth was slower than in media containing products such as yeast extract, it could be carried through successive transfers in the presence of the needed vitamins.

All of the oral lactobacilli required nicotinic acid, pantothenic acid and biotin. Many of them required vitamin B_6, supplied as pyridoxamine, or pteroylglutamic acid, or both. The need for vitamin B_6 and pteroylglutamic acid, when it occurred, was not always an absolute one, some strains developing poorly without one or the other of these compounds. Seventeen of the cultures required riboflavin and not thiamine, while 8 others required thiamine and not riboflavin.

A thiamine requirement was associated with the heterofermentative type of glucose metabolism, a finding in agreement with the previous report of others.

There were no essential differences in vitamin requirement between the older laboratory cultures as a group and the more recently isolated ones.

Purines and pyrimidines when added with the vitamins often accelerated the rate of growth, in some instances quite considerably. A mixture of several purines and pyrimidines produced a greater stimulation of growth than the individual compounds.

SALIVARY MUCIN AS A SOURCE OF ESSENTIAL AMINO ACIDS FOR THE LACTOBACILLUS ACIDOPHILUS (HADLEY)

Samuel Dreizen, Ann I. Reed and Tom D. Spies

It has been suggested that the mucin and mucinate contained in the dental plaque may serve as a source of nourishment for the organisms retained therein. This study was undertaken, therefore, to determine whether precipitated salivary mucin may serve as a source of essential amino acids for the *Lactobacillus acidophilus* in a synthetic medium containing all the other known growth requirements for this organism. The findings show that (1) precipitated salivary mucin, although rich in amino acids, is a poor replacement for tryptophane or casein hydrolysate or both in the Landy and Dicken medium which, when unmodified, is nutritionally adequate for the maximum growth of the Hadley strain of oral *L. acidophilus*. (2) The value of precipitated salivary mucin as a source of essential amino acids for the test organism was substantially enhanced by the addition of crystalline trypsin or amylopsin or both to the test medium from which casein hydrolysate or tryptophane or both was omitted. (3) Precipitated salivary mucin may serve as an efficient source of essential amino acids for the oral *L. acidophilus* in the presence of an exogenous source of proteolytic or amylolytic enzymes capable of hydrolyzing this glycoprotein.

AMINO ACIDS IN SALIVA OF HUMAN BEINGS ON A LOW PROTEIN DIET

E. R. Kirch, R. G. Kesel, J. F. O'Donnell and E. C. Wach

The saliva of human subjects, who were on a low nitrogen dietary intake, has been assayed for 8 amino acids by microbiological procedures. It is significant that these amino acids were found to be present in measurable quantities.

SOME ANTAGONISTIC ACTIVITY OF BACTERIA FROM THE HUMAN ORAL CAVITY

Charles A. Scrivener, Hugh I. Myers, Norman A. Moore and Ben W. Warner

Two saliva pools were used as source material. One pool was collected from caries-free persons and the other from individuals having 10 or more open carious lesions. A random sample of the bacteria contained in the saliva pools was obtained by using saline dilutions of 1:1, 1:10, 1:100 and 1:1,000 to inoculate and aerobically incubate culture plates containing 13 types of media. Thirty discernibly different types of bacterial colonies were found and established in pure culture. The antagonistic activity was tested first by the agar streak plate method with yeast dextrose agar using three strains of lactobacilli. Fourteen of the 30 showed some lactobacillus inhibition. Second, these 14, representing a variety of species, were tested for antagonistic activity against each other using the streak plate method. The number of other organisms each inhibited ranged from 0 to 12. The third and fourth tests, designed to test the ability of the antagonistic organisms to prevent dentin tooth fragment weight loss and calcium dissolution in sucrose broth by lactobacillus, were not effective in most instances.

INDUCED ALTERATIONS IN THE REACTION CAPACITY OF STREPTOCOCCUS ODONTOLYTICUS

Paul H. Belding and B. G. Edwards

A mucoid variant of *Streptococcus salivarius (Str. odontolyticus)* derived from the saliva of an individual afflicted with rampant dental caries has been demonstrated to digest milk under *in vitro* conditions. An extracted tooth placed in milk $CaCo_3$ and incubated with *Str. odontolyticus* evidenced superficial decalcification and a penetration and spreading of a destructive process between the enamel and dentin. In alkaline medium (potato $CaCo_3$) the organism lost its mucoid characteristics.

EFFECT OF A SELECTED NITROFURAN, FURACIN, ON THE ORAL LACTOBACILLUS COUNT

Robert D. Hufstader, Verner J. Anderson, Nilkanth Phatak and Marshall L. Snyder

Students selected on the basis of high lactobacillus counts chewed sugar-coated gum tablets without the drug for 1 hour 3 times daily over a 10 day period; lactobacillus counts were taken every third day. Gum tablets containing the drug (100 mg. of Furacin tablet) were chewed in the same manner for a consecutive 10 day period. Results were practically duplicated with a similar group of students 1 year later. The oral lactobacillus count increased during the period of chewing drugless gum; this level was not appreciably lowered as the result of chewing the gum containing the drug (300 mg. per day). The conclusion was that Furacin would have no effect on the oral lactobacillus count and probably would be of

little value in the chemotherapy of dental caries.

STUDIES ON EFFECT OF GONADECTOMY ON DENTAL CARIES ACTIVITY IN WHITE RATS AND IN COTTON RATS

James H. Shaw

The influence of gonadectomy upon the dental caries activity has been studied in caries-susceptible white rats and cotton rats which were fed a highly purified caries-producing diet. In both species, there was a consistent tendency toward a lesser average incidence of tooth decay in the gonadectomized rodents than in the intact littermates. The reduction in dental caries incidence was appreciably higher among orchidectomized males than among ovariectomized females. No difference was observed between the average dental caries activity in males and females for each species.

AN EFFECT OF REPRODUCTION ON THE DENTAL CARIES ACTIVITY IN WHITE RATS

James H. Shaw

The influence of reproduction upon dental caries experience has been investigated in caries-susceptible white rats which were maintained on a highly purified caries-producing diet. Under the conditions of this experimental regimen, the 30 females which had completed one or two reproductive cycles had a slightly lower average number of carious molars, a slightly lower average number of carious lesions, and a significantly lower average extent of tooth decay than their littermates which had never been pregnant.

THE EFFECT OF CONTROLLED WATER CONSUMPTION ON DENTAL CARIES IN WHITE RATS

C. A. Schlack, R. J. Gerende, V. J. Berzinskas, C. E. Mullins and B. L. Taylor

Sixty weanling white rats, representing 17 litters from a dental caries susceptible strain, were divided into 6 groups of 10 each, containing 5 males and 5 females in each group. The groups received 20.0 cc., 22.5 cc., 25.0 cc., 27.5 cc., 30.0 cc., and 32.5 cc., respectively of distilled drinking water daily, which they consumed. All rodents were fed a coarse corn cariogenic dietary. The quantity of distilled water consumption had no effect on dental caries incidence, supporting a previous study in which an indirect evaluation revealed similar results.

MICROSCOPICAL STUDY OF CARIES OF RATS' TEETH

Grant Van Huysen

Albino rats fed 31 days on a Hoppert, Weber and Caniff diet showed no evidence of gross caries. Ground histologic sections from 0.7 to 0.9 mm. thick showed that 85 per cent of 285 fissures contained plugs of soft, brown, fibrous material, assumed from its appearance to be impacted food. When caries occurred it attacked the enamel walls of the fissure close to but not quite at its apex and extended laterally towards the pulp horns undermining the cusps with subsequent fracture. In spite of the corn particle diet and violence of grinding the sections, there was initial fracturing in only one instance. It was concluded that the teeth of the albino rat on a Hoppert, Weber and Caniff diet do not fracture unless the cusps are first undermined by caries.

THE BASIC AMINO ACID CONTENT OF ENAMEL PROTEIN

F. L. Losee, B. A. Neidig and W. C. Hess

The histidine, lysine, and arginine content of enamel protein prepared from noncarious fully erupted permanent first and second molars has been determined by paper chromatography, chromatographic separation upon a mixture of Lloyd's reagent and Super-Cel, and by microbiologic assay. The mol ratios of these three amino acids are 1:3:9, in fairly close agreement with the ratios of 1:4:12 suggested for an eukeratin.

CHANGES IN ALKALINE PHOSPHATASE ACTIVITY OF RAT ORAL EPITHELIUM DURING THE ESTROUS CYCLE AND IN RESPONSE TO ADMINISTERED ESTROGEN

J. R. Ring and B. Levy

Application of the Gomori technic for histochemical localization of alkaline phosphatase demonstrates an increased activity of this enzyme in the buccal epithelium of albino female rats in response to elevated blood level of estrogenic hormone. Enzymatic activity is low in diestrus and in the ovariectomized animal and reaches a maximum in estrus and in spayed animals receiving estradiol benzoate by subcutaneous injection. The gingival epithelium exhibits only negligible activity of alkaline phosphatase regardless of estrogen

level. The distribution of demonstrable phosphatase in the normally cornified buccal epithelium of the rat suggests a relationship to the process of keratin formation.

THE USE OF CHLORAMPHENICOL (CHLOROMYCETIN) FOR KILLING SOME PENICILLIN-STREPTOMYCIN RESISTANT ORGANISMS ENCOUNTERED IN INFECTED ROOT CANALS

Samuel Seltzer and I. B. Bender

Enterococci have been isolated from infected root canals in 6 to 8 per cent of the cases following treatment with a penicillin-streptomycin combination. *In vitro* tests with various antibiotics were performed against 3 of the 4 known groups of enterococci, *Streptococcus zymogenes, Streptococcus faecalis* and *Streptococcus liquefaciens.* Using a serial dilution method, it was found that Chloromycetin was the most effective antibiotic of those tested against the enterococci. It was bactericidal at all strengths ranging from 25.0 to 0.32 mg. per ml. Synergistic effects against the enterococci were not demonstrated when penicillin and streptomycin were used in combination. It is recommended, therefore, that chloramphenicol be added to a combination of penicillin and streptomycin for effective root canal sterilization.

THE LACK OF ANTIVITAMIN ACTIVITY IN A HOMOLOGUE OF ASCORBIC ACID

William G. Shafer

A homologue of ascorbic acid, d-glucoascorbic acid, was fed in varying concentrations to a series of rats, hamsters and guinea pigs. Some systemic reactions were noted including diarrhea, alopecia and decreased rate of growth, but no signs of scurvy developed which could be demonstrated by histologic means. In the guinea pig, it appeared that the feeding of this compound may have given a slight protection against scurvy, but did not completely prevent the disease. Histologic description of the molar and incisor teeth and knee joints of these animals is given.

THE EFFECT OF SINGLE DOSES OF IRRADIATION UPON THE ERUPTION OF THE UPPER RAT INCISOR

H. Medak, I. Schour and W. A. Klauber, Jr.

The effects of a single exposure to x-ray on the eruption of the upper incisor were studied in 80 white rats weighing from 80 to 200 Gm. Animals were irradiated with 500 r, 1,000 r, 2,000 r, 2,500 r, 3,000 r, and 4,000 r. Eight animals were used as controls. The animals were observed up to 20 weeks. Only the area of the upper incisors was exposed to irradiation. The physical factors used were 100 kv., 5 milliamperes, skin target distance of 12½ cm., no filter, half-value layer of 1 mm. aluminum, and a field of 2.5 cm. The output was 320 r per minute. The rate of eruption was determined by notching the upper incisor at the gingival margin. The normal controls showed a weekly eruption rate of the upper incisor between 2.0 and 2.6 mm. per week. The animals receiving 500 and 1,000 r showed a similar curve. The animals receiving 2,000 r showed a dip in the eruption rate for the first 6 to 7 weeks and from then on a normal curve. Irradiation with 3,000 r and 4,000 r produced cessation of eruption within three weeks.

Deaths

Duff, David E., Clay Hill, S. C.; died September 13.

Frink, Edward C., Jamestown, N. D.; Dental School, Northwestern University, 1916; died January 11; aged 67.

Gaul, Edward C., Ottawa, Ill.; Dental School, Northwestern University, 1923; died January 7; aged 50.

Gerde, Magnus A., Minneapolis; College of Dentistry, University of Minnesota, 1917; died December 23; aged 59.

Gilgoff, Louis H., Springfield, Mass.; Dental School, Harvard University, 1915; died January 3.

Gillespie, Carl T., Stroud, Okla.; Western Dental College, 1908; died January 7; aged 65.

Ginsburg, Frederick, Passaic, N. J.; New York College of Dentistry, 1912; died January 11; aged 62.

Glade, Frederick R., Huntington Park, Calif.; College of Dentistry, University of Southern California, 1941; died January 17; aged 37.

Goldman, Matthew M., Newark, N. J.; School of Dentistry, University of Pennsylvania, 1907; died January 2.

Gray, Londa B., Albany, Ore.; died December 21.

Gray, William J., Springfield, Ill.; Dental School, Northwestern University, 1904; died December 23.

Guerra, Manuel G., Fall River, Mass.; Baltimore College of Dental Surgery, University of Maryland, 1914; died January 21; aged 65.

Gutting, Arthur F., Chicago, Ill.; Dental School, Northwestern University, 1916; died December 30; aged 57.

Hallen, Edward B., Mechanicville, N. Y.; School of Dentistry, Temple University, 1925; died February 2; aged 48.

Hartley, Stephen R., Georgiana, Ala.; Atlanta-Southern Dental College, 1908; died December 18; aged 69.

Heckman, Louis M., Jamesburg, N. J., Pennsylvania College of Dental Surgery, 1904; died January 22; aged 73.

Heineken, Ella R., Bristol, Pa.; died January 5.

Heisel, William F., Cleveland, Ohio; Ohio College of Dental Surgery, 1896; died December 17.

Hoffman, Thomas, Brighton, Mass.; George Washington University, 1910; died December 31; aged 64.

Hopkins, Chester T., Lynn, Mass.; Dental School, Harvard University, 1939; died in October.

Houck, Henry C., Seattle; School of Dentistry, North Pacific College of Oregon, 1918; died December 29; aged 55.

Houston, Roderick, Kalispell, Mont.; Chicago College of Dental Surgery, Loyola University, 1901; died December 3.

Hunter, William P. Fredericksburg, Va.; Baltimore College of Dental Surgery, 1913; died December 17.

Hyde, Edwin C., Glendale, Calif.; College of Dentistry, University of California, 1891; died December 25.

Jackson, Maimie, New York; School of Dentistry, University of Pennsylvania, 1919; died December 27; aged 75.

Jacobsen, Rudolf B., Los Angeles; College of Dentistry, University of Southern California, 1922; died December 16; aged 50.

Johnson, Clyde W., Lawton, Mich.; Dental School, Northwestern University, 1898; died December 9; aged 74.

Keltie, James, Boston; Boston Dental College, 1899; died December 11.

King, Alan G., Brooklyn; School of Dentistry, University of Buffalo, 1907; died December 17.

Kinum, Albert G., Millburn, N. J.; Baltimore College of Dental Surgery, University of Maryland, 1913; died January 11; aged 63.

Klausner, Eli G., St. Louis; School of Dentistry, St. Louis University, 1925; died December 8; aged 50.

Kuersten, Charles P., Denver, Colo.; died December 1.

Kurtz, Philip, Philadelphia; School of Dentistry, University of Pennsylvania, 1907; died December 27; aged 68.

Lewis, Warrington G., Jamaica, N. Y.; New York College of Dentistry, 1901; died January 4; aged 61.

Linder, William F., Browns Valley, Minn.; College of Dentistry, University of Minnesota, 1909; died November 29; aged 68.

Logan, Kenneth A., Chicago; died December 4.

Lucas, Harold T., Winner, S. D.; Kansas City Dental College, 1917; died December 13; aged 56.

Martin, George H., New York; Pennsylvania College of Dental Surgery, 1896; died December 20.

Mateer, Wesley H., Dorchester, Mass.; College of Dental Surgery, University of Michigan, 1901; died July 23.

McBroome, Elliot E., Columbus, Ohio; Department of Dentistry, Starling-Ohio Medical College, 1914; died December 17; aged 61.

McCahon, James H., Newark, Ohio; died December 27.

McDaniel, Glen M., Bloomington, Ind.; Indiana Dental College, 1915; died December 5; aged 58.

McFarlane, William S., Watertown, N. Y.; School of Dentistry, University of Buffalo, 1897; died December 8; aged 76.

McLaughlin, Harry H., Bruning, Neb.; Baltimore College of Dental Surgery, 1905; died December 3.

Micone, Stephen L., Newark, N. J.; Baltimore College of Dental Surgery, 1923; died January 3; aged 60.

Morris, Harold G., Youngstown, Ohio; College of Dentistry, Ohio State University, 1923; died December 24; aged 51.

Oleon, William, Swissvale, Pa.; School of Dentistry, North Pacific College of Oregon, 1914; died November 28; aged 58.

Parsons, Donzia R., Huntington, W. Va.; Baltimore College of Dental Surgery, 1918; died November 29; aged 58.

Perrault, Arthur J., Opelousas, La.; School of Dentistry, Tulane University, 1910; died November 24; aged 63.

Peterson, Carl E., Veblen, S. D.; Dental School, Northwestern University, 1918; died December 3; aged 59.

Plate, Frederick H., Richmond Hill, N. Y.; died September 29.

Puffer, George R., Chicago; Dental School, Northwestern University, 1906; died December 17.

Putnam, Floyd E., Eden Valley, Minn.; College of Dentistry University of Minnesota, 1913; died November 10; aged 62.

Rafferty, Andrew A., Worcester, Mass.; Dental School, Harvard University, 1918; died November 2; aged 57.

Raichart, Goran W., San Diego, Calif.; died December 27.

Ramsey, Thomas B., Lexington, Mo.; Kansas City Dental College, 1898; died November 6; aged 75.

Ranshaw, Alvin A., Covington, Ky.; died November 11; aged 74.

Ringwalt, Raymond E., Madison, Ind.; School of Dentistry, Indiana University, 1925; died December 1.

Rogers, Arthur V., Boston, Mass.; Dental School, Harvard University, 1901; died December 12.

Rosenstein, Philip F., Houston; College of Dentistry, Baylor University, 1920; died December 6; aged 51.

Schilling, Charles S., Cincinnati; Ohio College of Dental Surgery, University of Cincinnati, 1912; died November 24; aged 66.

Schlosser, Roger S., Hagerstown, Md.; Baltimore College of Dental Surgery, University of Maryland, 1914; died December 21; aged 58.

Sibley, D. Jacobi, Fort Stockton, Texas; School of Dentistry, Vanderbilt University, 1906; died July 21; aged 72.

Sikes, Andry L., Miami, Fla.; Atlanta-Southern Dental College, 1934; died January 3; aged 42.

Simonds, Grant H., Medina, N. Y.; University of Buffalo, School of Dentistry, 1895; died December 22.

Slayton, Richard B., Kansas City, Kan.; Western Dental College, Kansas City, 1906; died December 30; aged 67.

Soholm, Waldo E., Spencer, Iowa; College of Dentistry, University of Iowa, 1928; died December 13; aged 44.

Spurgeon, John H., Hillsboro, N. C.; School of Dentistry, Vanderbilt University, 1886; died December 28; aged 87.

Stegeman, George A., Holland, Mich.; College of Dental Surgery, University of Michigan, 1902; died December 9.

Voge, William L., Boston; Dental School, Tufts College, 1918; died November 11; aged 72.

Wagg, John A., Manasquan, N. J.; School of Dentistry, University of Pennsylvania, 1907; died December 2; aged 65.

Wagner, George S., Lancaster, Pa.; School of Dentistry, Temple University, 1897; died November 7; aged 83.

Weakley, George B., Springfield, Ill.; School of Dentistry, University of Pennsylvania, 1898; died November 18; aged 77.

Webb, Homer C., Atlanta, Ga.; died September 20; aged 61.

Wellner, Roy D., Windom, Minn.; College of Dentistry, University of Minnesota, 1928; died August 4; aged 51.

Wisnow, Helen, Cicero, Ill.; Dental School, Northwestern University, 1923; died October 27; aged 48.

Wright, Alvin O., Oakland, Calif.; College of Dental Surgery, University of Michigan, 1898; died July 27; aged 82.

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THE JOURNAL OF THE AMERICAN DENTAL ASSOCIATION
222 East Superior Street, Chicago 11, Illinois
WHitehall 4-6730

LON W. MORREY, *Editor* JOHN J. HOLLISTER, *Business Manager*

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Announcements

AMERICAN DENTAL ASSOCIATION

Ninety-Second Annual Session	Oct. 15-18, 1951	Washington, D. C.
Ninety-Third Annual Session	Sept. 8-11, 1952	St. Louis
Ninety-Fourth Annual Session	Sept. 28-Oct. 1, 1953	Cleveland

MEETINGS OF STATE SOCIETIES

State	Date	Place	Secretary	Address
Alabama			G. W. Matthews	1922 Tenth Ave., S., Birmingham 5
Alaska	May		J. Geyer	Box 915, Juneau
Arizona			H. G. DeWolf	Valley National Bank Bldg., Tucson
Arkansas			D. M. Hamm	White Bldg., Clarksville
California			L. R. Ludwigsen	450 Sutter St., San Francisco
S. California			C. A. Moss	1401 S. Hope St., Los Angeles
Colorado	Oct. 1-4	Colorado Springs	R. A. Downs	724 Republic Bldg., Denver 2
Connecticut			E. S. Arnold	37 Linnard Rd., W. Hartford
Delaware	Jan. 1952		S. J. Krygier	309 S. State St., Dover
District of Columbia			K. H. Wood	202-1835 Eye St., N. W., Washington
Florida	April 29-May 2	Hollywood	L. M. Schulstad	Professional Bldg., Bradenton
Georgia	Sept. 23-26	Atlanta	J. M. Heard, Jr.	Persons Bldg., Macon
Hawaii	Sept. 27-29	Hilo	J. H. Dawe	810 N. Vineyard St., Honolulu 17
Idaho	Sept. 27-29	Lewiston	H. M. Klaaren	Breier Bldg., Lewiston
Illinois	May 7-10	Peoria	P. W. Clopper	623 Jefferson Bldg., Peoria 2
Indiana	May 21-23	Indianapolis	E. E. Ewbank	Kingman
Iowa	May 7-9	Des Moines	H. I. Wilson	639 Insurance Exchange Bldg., Des Moines
Kansas	May 6-9	Wichita	F. A. Richmond	Brotherhood Bldg., Kansas City
Kentucky			A. B. Coxwell	1976 Douglass Blvd., Louisville
Louisiana			J. S. Bernhard	407 Medical Arts Bldg., Shreveport
Maine	June 28-30	Rockland	F. P. Gilley	31 Central St., Bangor
Maryland	May 7-9	Baltimore	E. L. Pessagno, Jr.	415 Medical Arts Bldg., Baltimore 1
Massachusetts	April 30-May 2	Boston	H. E. Tingley	12 Bay State Road, Boston
Michigan			F. Wertheimer	Michigan Dept. of Health, Lansing
Minnesota	Feb. 18-20, 1952	St. Paul	C. V. E. Cassel	242 Lowry Medical Arts Bldg., St. Paul
Mississippi	April 29-May 2	Jackson	H. M. Campbell	Tupelo
Missouri			R. R. Rhoades	201 Merchants Bank Bldg., Jefferson City
Montana	May 3-5	Billings	C. S. Renouard	304 Phoenix Bldg., Butte
Nebraska	May 14-16	Lincoln	F. A. Pierson	Federal Security Bldg., Lincoln
Nevada	June 1, 2	Reno	W. R. Bell	Medical Arts Bldg., Reno
New Hampshire	June 17-19	Bretton Woods	F. E. Williams	814 Elm St., Manchester
New Jersey			J. G. Carr	407 Cooper St., Camden
New Mexico	May 21-23	Sante Fe	J. S. Eilar	Suite 7, Medical Arts Square, Albuquerque
New York	May 7-11	Buffalo	C. A. Wilkie	1 Hanson Place, Brooklyn
North Carolina	April 30-May 2	Pinehurst	B. N. Walker	Liberty Life Bldg., Charlotte
North Dakota	May 17-20	Grand Forks	J. H. Lunday	Fargo
Ohio	Nov. 25-28	Cleveland	E. G. Jones	185 E. State St., Columbus
Oklahoma			R. C. Calkin	109½ W. Oklahoma, Guthrie
Oregon	Mar. 3-5, 1952	Portland	H. C. Fixott, Jr.	308 Selling Bldg., Portland
Panama Canal Zone	Dec.	Balboa	O. Slavin	Box 415, Balboa
Pennsylvania	Sept. 11-14	Pittsburgh	M. D. Zimmerman	217 State St., Harrisburg
Puerto Rico	Jan. 1952	San Juan	R. Carrasquillo	Box 214, Rio Piedras
Rhode Island	Jan. 1952	Providence	M. L. Biderman	144 Westminster St., Providence
South Carolina	May 6-8	Charleston	J. R. Owings	800 Pendleton St., Greenville
South Dakota	May 20-22	Watertown	E. W. Elmen	Sioux Falls
Tennessee	May 7-9	Nashville	E. J. Justis	Exchange Bldg., Memphis
Texas	April 30-May 3	San Antonio	W. Ogle	310 N. Ervay St., Dallas

State	Date	Place	Secretary	Address
Utah		Ogden	B. P. McBride	Medical Arts Bldg., Salt Lake City
Vermont	May 20-22	Woodstock	J. A. Larrow	Middlebury
Virginia			J. E. John	804 Medical Arts Bldg., Roanoke
Washington			C. R. Flood	230 Cobb Bldg., Seattle
West Virginia	July 16-18	White Sulphur Springs	A. B. Drake	508 West Virginia Bldg., Huntington 1
Wisconsin	April 14-17, 1952	Milwaukee	R. A. Mason	964 N. 27th St., Milwaukee
Wyoming	June 20-23	Sheridan	T. J. Drew	State Capitol, Cheyenne

MEETINGS OF STATE BOARDS OF DENTAL EXAMINERS

State	Date	Place	Secretary	Address
Alabama	June 18	Birmingham	M. D. Edwards	120 Adams, Montgomery
Alaska	Aug. 6-11	Ketchikan	J. H. Geyer	Juneau
Arizona		Florence	R. K. Trueblood	25 N. Second Av., Glendale
Arkansas	June 25-28	Little Rock	H. O. Weatherly	205 Halter Bldg., Conway
California	June 18	Los Angeles	K. I. Nesbitt	507 Polk St.,
	July 23	San Francisco		San Francisco 2
Colorado	June 18-22	Denver	W. D. McCarthy	724 Republic Bldg., Denver 2
Connecticut	June 19-23*	Hartford	C. G. Brooks	302 State St., New London
Delaware	June 27-29*	Wilmington	P. K. Musselman	143 W. Main St., Newark
District of Columbia	June	Washington	W. M. Falls	1801 Eye St., N. W., Washington 6
Florida	July 9-14*	Jacksonville	A. W. Kellner	P. O. Box 155, Hollywood
Georgia	June	Atlanta	S. H. Yarbrough	Medical Arts Bldg., Columbus
Hawaii	Aug.	Honolulu	H. L. Houvener	7-8 Pantheon Bldg., Honolulu
Idaho	Aug. 7	Boise	W. K. Adams	718 Arthur St., Caldwell
Illinois	June 26-29	Chicago	W. A. McKee	503 Wood Bldg., Benton
Indiana	June 19-22	Indianapolis	C. A. Frech	504 Broadway, Gary
Iowa	May 21-25*	Iowa City	H. M. Willits	719 Roshek Bldg., Dubuque
Kansas	June 6	Kansas City	G. L. Teall	Box 71, Hiawatha
Kentucky	June 4-8*	Louisville	R. I. Todd	Western Union Bldg., Richmond
Louisiana	June 6	New Orleans	A. R. deNux	Marksville
Maine	June 18-21	Boston	R. A. Derbyshire	Box 387, Skowhegan
Maryland	June	Baltimore	W. D. Day	3811 Hadley Square E., Baltimore 18
Massachusetts	June 25-29§	Boston	J. C. Wilson	33 State House,
	June 27-29‡‡			Boston
Michigan	June 10	Ann Arbor	J. L. Champagne	3714 W. McNichols Road, Detroit 21
Minnesota	June 13-17	Minneapolis	F. A. Larson	1632 Washington St., N.E., Minneapolis
Mississippi	June 19-21	Jackson	J. C. Boswell	508 Lamar Bldg., Jackson
Missouri	June	Kansas City	R. R. Rhoades	Central Trust Bldg., Jefferson City
Montana	July 9-13	Helena	P. M. Feda	Box 865, Helena
Nebraska	June 1, 2**	Lincoln	C. A. Bumstead	924 Stuart Bldg., Lincoln
	June 4-6††	Lincoln and Omaha		
Nevada	June 4	Reno	G. C. Steinmiller	Masonic Temple, Reno
New Hampshire	June 28, 29	Boston	J. B. Brown	5 N. State St., Concord
New Jersey	June 18, 19††	New York	W. A. Wilson	150 E. State St., Trenton 8
	June 25, 26††	Philadelphia		
	June 27-29**	Trenton		
New Mexico	July 2-5	Santa Fe	J. J. Clarke, Sr.	Artesia
New York			D. W. Beier	23 S. Pearl St., Albany 7
North Carolina	June 25	Raleigh	F. O. Alford	1109 Liberty Life Bldg., Charlotte 2
North Dakota	July 9-12	Fargo	A. B. Crabtree	Ellendale
Ohio	June 25-29	Columbus	E. D. Lowry	79 E. State St., Columbus
Oklahoma	June 18-20	Oklahoma City	J. B. Cole, Jr.	706 Asp, Norman
Oregon	June 11-15	Portland	A. F. Davis	306 Public Service Bldg., Portland
Pennsylvania	May 21-23† and May 22‡	Pittsburgh	R. E. V. Miller	Northampton National Bank Bldg., Easton
	June 4-6† and June 5‡	Philadelphia		
	June 18-20† and June 20‡	Philadelphia		
	June 21-23**	Philadelphia and Pittsburgh		
Puerto Rico		Santurce	L. C. Coll	Box 3717, Santurce
Rhode Island	June 26, 27	Providence	F. M. Hackett	267 Academy Ave., Providence
South Carolina	June 18	Columbia	E. G. Bumgardner	1517 Hampton St., Columbia
South Dakota	June 24	Sioux Falls	K. A. Stormo	Lead
Tennessee	June	Memphis	F. S. Maxey	804 Bennie Dillon Bldg., Nashville 3
Texas	June 10-15	Houston	R. T. Weber	312 Capital National Bank Bldg., Austin

State	Date	Place	Secretary	Address
Utah	July 16-21	Salt Lake City	J. J. Dalpiaz	Helper
Vermont	June 25-27	Burlington	F. A. Reid	Windsor
Virginia	June 12	Richmond	J. M. Hughes	715 Medical Arts Bldg., Richmond 19
Washington	June 18-22	Seattle	J. B. Kiefer, Jr.	510 Cobb Bldg., Seattle
West Virginia	June 25-27	West Liberty	C. A. Laughlin	613 Prunty Bldg., Clarksburg
Wisconsin	June 18*	Milwaukee	S. F. Donovan	Tomah
Wyoming			W. J. Ryan	208 Boyd Bldg., Cheyenne

*Dentistry and dental hygiene.
†Dental clinical examinations.
‡Dental hygiene clinical examinations.
§Dental examinations.

**Written examinations.
††Clinical examinations.
‡‡Hygienists' examinations.

OTHER MEETINGS

Name	Date	City	Secy. or Chm.	Address
Academy of Denture Prosthetics, Annual Meeting	April 30-May 6	Washington, D. C.	I. L. Furnas Secy.	928 Silverado St., La Jolla, Calif.
American Academy of Dental Medicine	June 22-24	Atlantic City, N. J.	W. M. Greenhut Secy.	124 E. 84th St., New York 28
American Association of Dental Examiners	Oct. 12, 13	Washington, D. C.	C. A. Bumstead Secy.	924 Stuart Bldg., Lincoln, Neb.
American Dental Society of Europe	Aug. 1-4	Lausanne, Switzerland	F. D. Derrick Secy.	140 Park Lane, London, W.1.
American Denture Society	Oct. 13, 14	Washington, D. C.	A. L. Roberts Secy.	Aurora National Bank Bldg. Aurora, Ill.
American Society of Dentistry for Children, Annual Convention	Oct. 12-14	Washington, D. C.	M. Kelner Program Chm.	1930 Chestnut St., Philadelphia 3
Canadian Dental Association, Annual Meeting	Sept. 23-26	Ottawa, Ontario	D. W. Gullett Secy.	234 St. George St., Toronto 5, Ontario, Canada
Eleventh International Dental Conference	July 19-26, 1952	London, England	D. Downton Hon. Secy.	13 Hill Street, London W.1, England
Federation Dentaire Internationale, Thirty-Ninth Annual Meeting	June 9-16	Brussels, Belgium	M. F. Watry Secy.	35, rue Souveraine, Brussels, Belgium
Great Lakes Society of Orthodontists, Twenty-Second Annual Meeting	Nov. 5-7	Cleveland	C. R. Anderson Secy.	402 Loraine Bldg., Grand Rapids, Mich.
International Academy of Anesthesiology	May 16	New York	I. G. Tomack Exec. Secy.	355 E. 149th St., New York 55
National Dental Association, Thirty-Eighth Annual Meeting	Aug. 13-17	Memphis, Tenn.	J. A. Jackson Secy.	P. O. Box 197, Charlottesville, Va.
New England Dental Society, Annual Meeting	Sept. 26, 27	Boston	A. R. Wilson Secy.	43 Farmington Ave., Hartford 5
Pacific Coast Dental Conference (Eighth)	June 25-28	Seattle	C. R. Flood Secy.	605 Medical-Dental Bldg., Seattle 1
Southern Society of Orthodontists, Twenty-Seventh Annual Meeting	July 31-Aug. 2	White Sulphur Springs, W. Va.	F. P. Bowyer Secy.	608 Medical Arts Bldg., Knoxville, Tenn.
Thirteenth International Congress of Military Medicine and Pharmacy	June 17-23	Paris, France	A. Boucher Gen. Secy. Dental Section	37, rue de Rivoli, Paris IV, France

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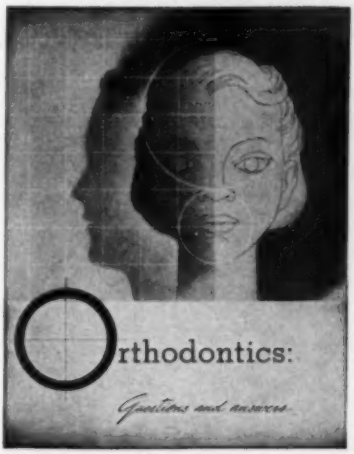

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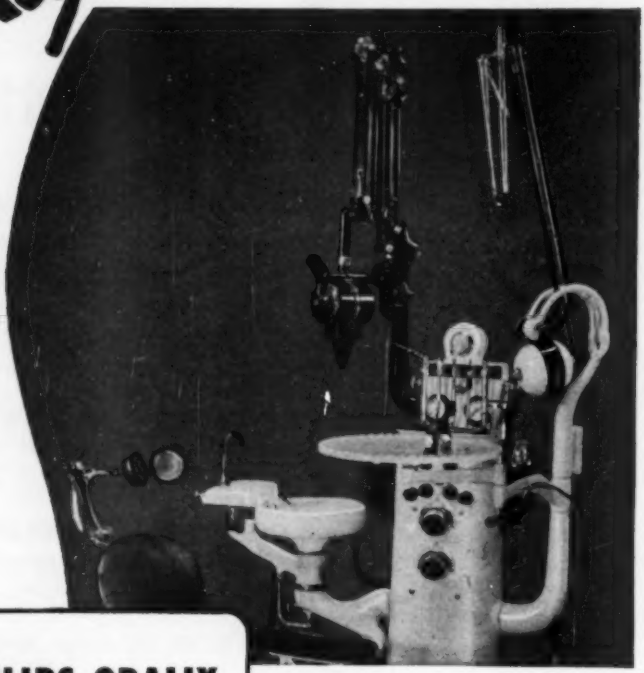

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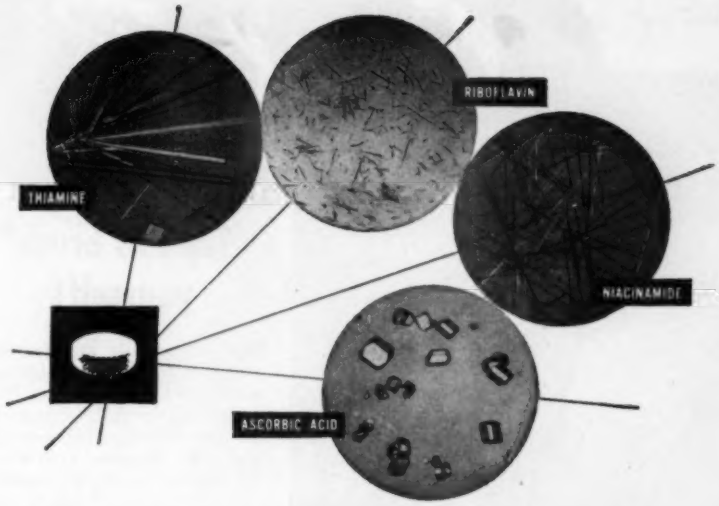

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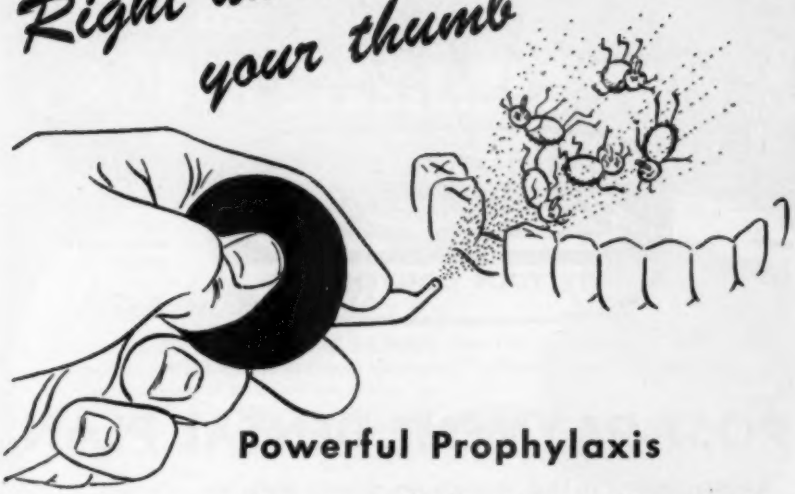

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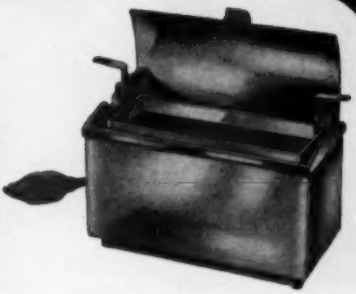

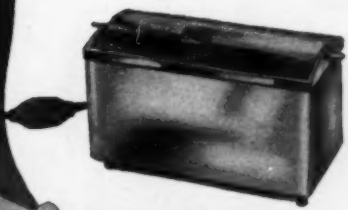

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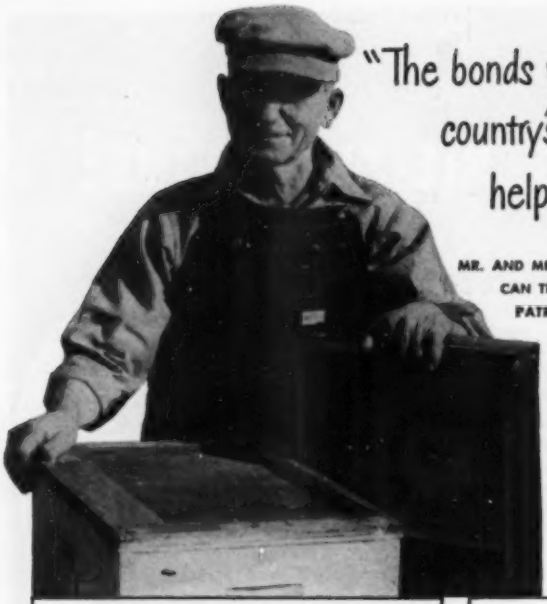

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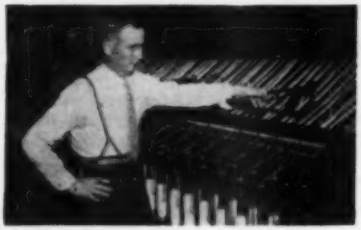
Mr. Whatley inspects a beehive on his 202-acre Georgia farm. "My wife and I wouldn't own a farm, clear, today," he says, "if it weren't for U. S. Savings Bonds. They're the best way to save."



Charley Whatley says, "Mrs. Whatley and I joined the Payroll Savings Plan in 1943. Our pay averaged about $40 a week apiece and we put about a quarter of it into bonds. We had saved $6,925 by 1950."

"$4,000 in bonds bought us our farm and house, more bonds went for a new truck, refrigerator and electric range. We're still holding about $1,800 in bonds. Everybody should buy U. S. Savings Bonds!"

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Your dream can come true, just as the Whatleys' did. *Start now!* It's easy! Just take these three simple steps:

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3. Start saving by signing up *today* in the Payroll Savings Plan where you work or the Bond-A-Month Plan where you bank.

You'll be providing security not only for yourself and your family, but for the free way of life that's so important to us all.

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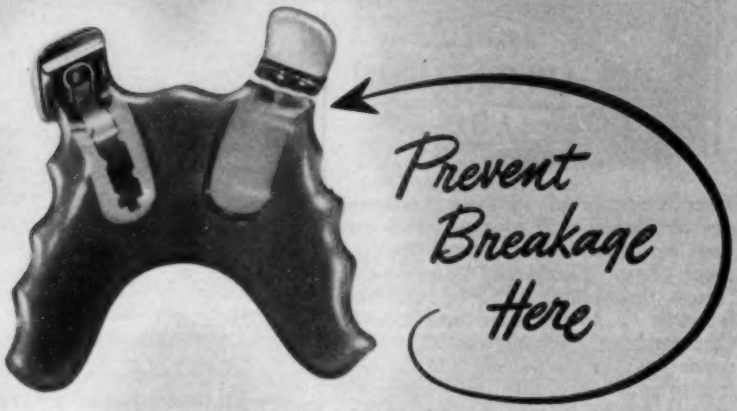
. . . In plastic partial dentures with one or more *isolated* teeth



In partial dentures of this type the thin, narrow area of vulcanite or acrylic material supporting one or more teeth is a critical area—usually lacking in strength and rigidity. The logical engineering solution is to span this area with *embedded metal reinforcing*—just as concrete structures are reinforced with steel rods.

Steele's DENTURE BACKINGS accomplish this by means of an attached reinforcing bar which is embedded in the denture material, adding strength and rigidity to the critical area. The reinforcing bar is adjustable for ridges of various height. A shoulder on the lingual of the backing provides an accurate finish line for the denture material. The backings are available for either Steele's Flatback, or P. B. E. facings. Ask your dealer for "Steele's Denture Backing Technic."

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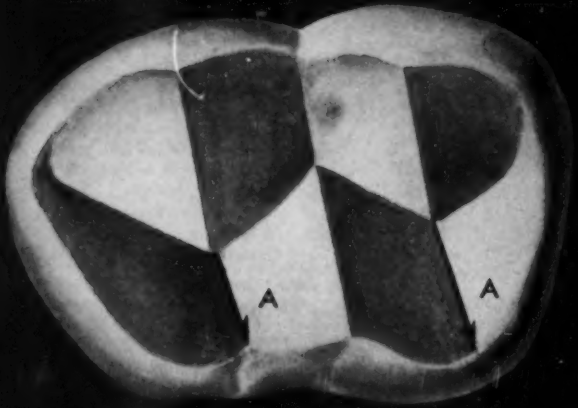
AND TO AVOID CUSPAL INTERFERENCE



NOTE *Note grooves A A in above upper first molar. Lower buccal cusps slide smoothly along these directional arrows with no mechanical interference.*

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flx*

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Posteriors

● Note sharp cusp ridges; surfaces that meet at cusp ridges are flat and smooth.

Between lingual cusp ridges, instead of natural sulci there are two grooves directed inward and anteriorly following natural movement of lower jaw. Buccal cusps of lower molar slide along these grooves without mechanical interference. This unusual formation operates to keep cusp ridges sharp and prevent dimensional loss of teeth.

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WITHOUT GASTRIC DISTRESS!

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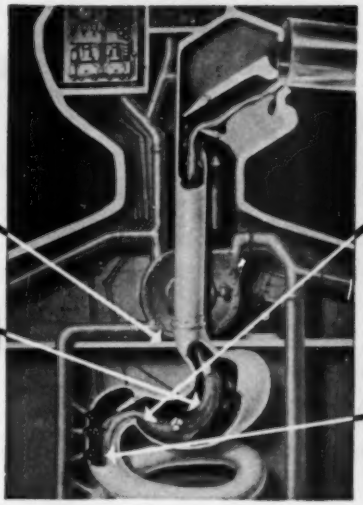
2. BUFFERIN exerts its antacid effect, lessening the possibility of gastric distress.



3. BUFFERIN helps dilate the pyloric valve, promptly leaves the stomach.

4. BUFFERIN's analgesic component is absorbed into the blood *twice as fast as aspirin,* relieves pain.

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1. Effect of Buffering Agents on Absorption of Acetylsalicylic Acid. J. Am. Pharm. A., Sc. Ed. 39:21, Jan. 1950.

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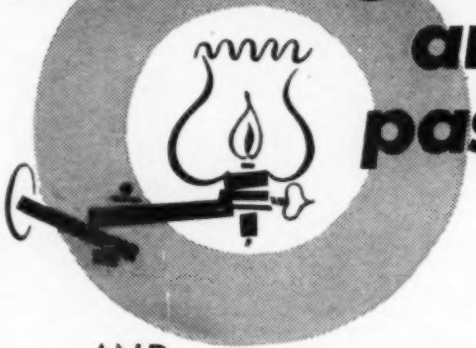
How chrome alloys differ... #3 in a series

GAS lights are passé



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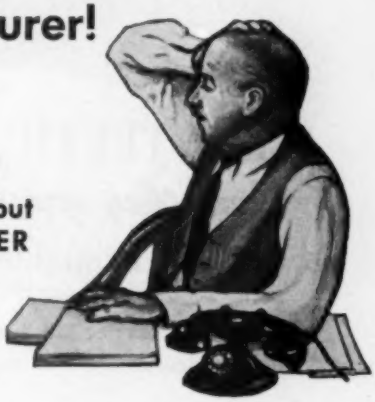

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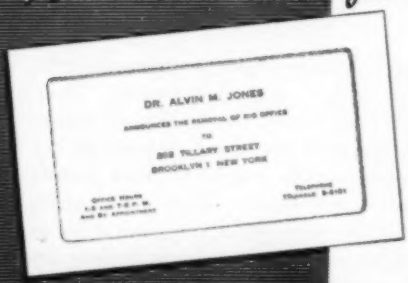

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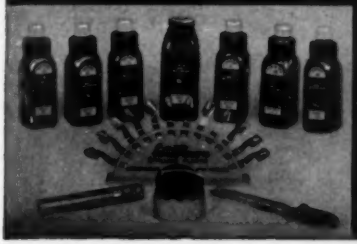

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Forms close on 25th of second month preceding month of issue

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•

(b) Oral surgeon to become associated with oral surgeon long established in California.

•

(c) Orthodontist to become associated with orthodontist; vicinity New York City.

•

(d) Pedodontist to become associated with dentist having large general practice; university town; Midwest.

•

(e) General dentist to join dental department; 22-man clinic; Winter resort area. Southwest.

•

(f) Dentist for full-time hospital position; college town; South.

•

(g) Part-time dentist; general practice; growing Long Island community.

•

(h) Associate; general practice; minimum $500; early partnership; South Dakota.

•

(i) Prosthodontist; association, long established practice; Minnesota.

•

(j) School dentist; West Virginia.

•

(k) Orthodontist to become associated with orthodontist well established in Wisconsin.

•

(l) Associate; general practice of dentistry; $700-$1000; vicinity Baltimore.

•

(m) Public health dentist; administrative post; state health department; West.

•

(n) Young dentist interested in children's dentistry and particularly well qualified operative dentistry to become associated with dentist well established college town, Massachusetts; partnership possibilities.

•

(o) Oral surgeon to associate with general practitioner; long established; Pennsylvania.

•

(p) Associate; should be interested in children's dentistry; Maryland.

•

(q) Resident in oral surgery; university center, Midwest.

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(f) Orthodontist; D.D.S. Northwestern; recently completed graduate training orthodontia for which he received M.S. degree; successful general practice before specializing.

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(g) Public health dentist; eight years, private practice of general dentistry, simultaneously serving as director, dental clinic, public schools; two years, public health dentistry for children, state department of health.

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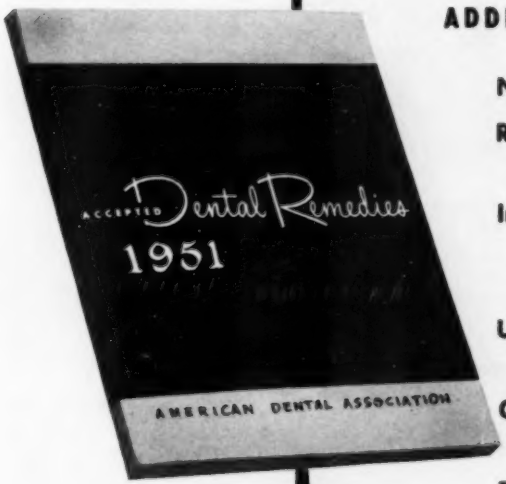

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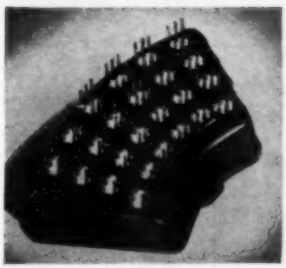

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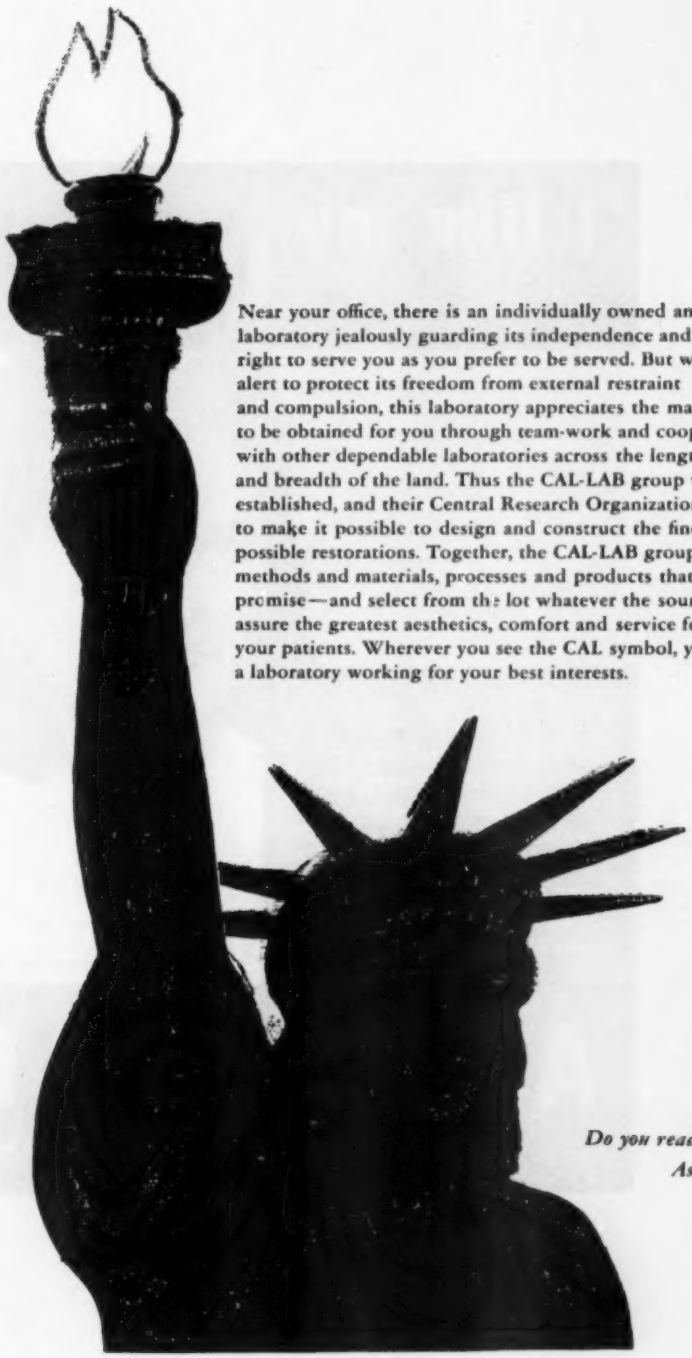

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